THE WELFARE AND DISTRIBUTIONAL EFFECTS OF INCREASING TAXES ON TOBACCO IN VIETNAM

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EXECUTIVE SUMMARY

This paper assesses the welfare and distributional effects of raising taxes on tobacco in Vietnam. Tobacco taxes are recognized as effective policy tools to reduce tobacco consumption and to improve health outcomes. However, policy makers often hesitate to use them because of claims of their potentially regressive effects. According to those claims, poorer households are particularly hurt by tobacco tax policies, as cigarette purchases represent a larger share of their budgets relative to higher-income smokers.

The paper argues that the claims on the regressive effects of tobacco tax policies are based on naive, shortsighted, and incorrect estimations. Tobacco-related illnesses damage health outcomes and the quality of the lives of smokers and their families, while they also cost billions of dollars in medical expenditures and losses in human capital and productivity every year. Tobacco consumption imposes heavy economic burdens on households and governments, in addition to its well-known negative health and social impacts. Raising taxes on cigarettes dissuades consumption, hence improving health outcomes, averting premature deaths, and reducing direct and indirect economic costs.

The analysis applies the Extended Cost Benefit Analysis (ECBA) methodology to simulate empirically the costs, as well as the benefits of increasing the prices on cigarettes on the welfare of Vietnamese households. Following a well-established body of literature, the ECBA acknowledges that there may be short-term direct negative effects of raising prices on tobacco, as smokers can struggle to continue to purchase tobacco with their unchanged household budgets. However, the model also incorporates two of the main benefits of reducing tobacco consumption by increasing taxes: (a) the reduction in smoking-related medical expenses borne by households and (b) the additional incomes that households can earn by preventing years of productive life lost due to smoking-attributable premature deaths.

A critical contribution of the ECBA is to incorporate decile-specific price elasticities of demand for cigarettes, to quantify the behavioral responses or sensitivity of smokers in different income groups to changes in cigarette prices. To the knowledge of the authors, this is the first available empirical exercise to estimate price elasticities by income decile in Vietnam. Consistent with the literature and with empirical findings in other countries, the price elasticities of demand for cigarettes are larger for lower-income households. Lower-income smokers are likely to reduce their tobacco consumption more drastically, when

faced with a price increase. The ultimate distributional effect on welfare of the increase in the price of cigarettes due to tax increases will then depend on assessing the potential benefits against the short-term costs.

Expenditure data are gathered from the Vietnam Household Living Standards Survey (VHLSS). These are complemented with estimations of the direct medical costs of tobacco-attributable diseases and estimated premature deaths related to the risk of smoking based on data of the Global Burden of Disease Project. Different price shock scenarios are simulated to approximate the effects of the currently considered policy scenarios, namely, imposing an additional specific excise of D 1,000, D 3,000, and D 5,000 per pack of cigarettes, as well as a cumulative excise increase of D 2,000 every year for five years.

The results contradict the claims that taxing cigarettes has regressive effects. Instead, the evidence suggests that raising taxes on cigarettes can contribute to poverty reduction and equity efforts in Vietnam. Consistent with recent findings in a variety of countries, the ECBA suggests that raising taxes on tobacco can be progressive and welfare-improving in Vietnam. Assuming that the price shocks are large enough and consumers are responsive to price changes, the benefits outweigh the direct short-term costs of raising taxes, resulting in positive income gains for large segments of the population. Moreover, across all simulations, poorer Vietnamese households are likely to capture the highest net benefits (or suffer the least net costs), relative to higher-income peers. Adopting a mixed tax system by raising the specific excise on cigarettes could increase the progressivity in the distribution of net benefits, relative to a purely ad valorem price increase. But this outcome requires that the price shock be large enough to capture the benefits of smoking-reductions among lower-income households.

The paper focuses on the effects of raising taxes on tobacco on poor and vulnerable households. Based on the empirical simulations, it is estimated that up to 170,000 Vietnamese could overcome poverty every year if cigarette prices increased by an average 80 percent. A similar price increase could also prevent the impoverishment of 20,000 Vietnamese every year due to tobacco-related out-of-pocket (OOP) medical expenses and save up to 30,000 people annually from smoking-related premature deaths.

The ECBA simulations provide extensive evidence of the progressive and welfare-improving potential of raising taxes on tobacco. However, they are likely to constitute a conservative scenario of the total economic and social benefits of raising cigarette taxes to reduce smoking in Vietnam. The ECBA is yet to account for the costs in labor productivity due to illness and sick days and the effects of secondhand smoking. Other elements—

including the intrinsic value of human lives lost to tobacco-attributable diseases—lie outside the scope of these models, but constitute significant social and economic costs of smoking that could be averted by raising taxes on cigarettes. In the case of Vietnam, availability of up-to-date microdata on cigarette consumption and more accurate estimations of tobacco-attributable medical expenditures can refine the application of the ECBA in the future.

INTRODUCTION

Despite significant improvements in welfare indicators and in the quality of life of millions of Vietnamese over the last decades, the country is yet to meet its targets of reducing tobacco consumption and lessening the health, social, and economic burdens associated with smoking. Tobacco-related diseases—including stroke, coronary artery disease, lung cancer, and chronic obstructive pulmonary disease—already constitute the leading causes of death in Vietnam (Nhung et al. 2008). It is estimated that up to 10 percent of the Vietnamese population alive today will die prematurely from such diseases as a result of tobacco consumption, half of them likely to die during their productive middle age (Eozenou and Fishburn 2007).

Tobacco products in Vietnam are widespread and affordable. The affordability of tobacco products has consistently increased over the past decades, driven by Vietnam's rapid growth and the higher purchasing power of households. Taxes on tobacco have long been recognized as effective measures to induce price increases and discourage consumption (World Bank 1999, 2017). Raising taxes on tobacco discourages current and potential smoking by increasing prices and reducing the relative affordability of tobacco products. However, tobacco taxes in Vietnam remain far below international recommendations by the World Health Organization (WHO), so contributing to readily avoidable diseases and premature mortality. Concerns over the distributional impact of increasing taxes on tobacco have traditionally been used to argue against tobacco taxation policies in Vietnam and other countries. Most commonly, it has been argued that increasing taxes on tobacco is likely regressive, imposing higher tax burdens on poorer households, which tend to allocate higher shares of their incomes to purchase tobacco relative to higher-income peers.

This paper aims to test empirically the claims on the distributional effects of increasing taxes on tobacco in Vietnam. It analyses microdata from the Household Living Standards Survey (VHLSS) and the Global Adult Tobacco Survey (GATS) and other available sources to carry out an Extended Cost Benefit Analysis (ECBA) on the potential effects of raising taxes on tobacco products under different simulated scenarios. It is argued that naive estimations that find the effects of tobacco taxation regressive often fail to account for behavioral adjustments by consumers and neglect to consider the economic benefits that arise from improving health outcomes as tobacco consumption drops. To the authors'

knowledge, this is the first attempt to address these concerns for the case of Vietnam. Price elasticities of demand for tobacco products are estimated at the income decile-level for Vietnamese households.

The benefits of reducing smoking are estimated as reductions in tobacco-related medical expenses and in forgone household earnings due to tobacco-attributable years of life lost. Across different simulations, the results provide evidence of the net progressive fiscal incidence of taxing tobacco in Vietnam. Under higher elasticity or longer-term scenarios, the economic benefits to households derived from improved health can outweigh the costs of increased tobacco expenditures after the price shock. Large shares of the population—and particularly the poor—benefit from net positive income gains as the prices of cigarettes increase. The simulation results suggest that increasing taxes on tobacco can reduce the number of poor people in Vietnam, contribute to preventing smoking-attributable premature deaths, and reduce impoverishment as a result of tobacco-related medical expenses. These estimated gains under the ECBA, however, constitute a conservative picture of the total benefits of raising taxes on tobacco. The people of Vietnam would additionally benefit from reducing secondhand smoking, increasing productivity of workers, improving the quality of life of smokers and their families, and potentially investing additional tax revenues in social and health programs, among other positive effects of increasing taxes on cigarettes.

The rest of the study is structured as follows. Section 2 provides a background on tobacco consumption and tobacco-control policies in Vietnam. Section 3 reviews the literature on the welfare and distributional effects of tobacco consumption and tobacco taxation in the country. It focuses on existing evidence on the price elasticity of demand for tobacco products in Vietnam. The components and theoretical assumptions of the ECBA model are outlined in Section 4. Section 5 presents an overview of data sources and basic descriptive statistics. Results for each component of the model, as well as the net distributional income changes are presented in Section 6, including simulations under different price shock and elasticity scenarios. The final section highlights the main implications for policy and research agendas.

2

BACKGROUND: TOBACCO CONSUMPTION AND TAXES IN VIETNAM

Prevalence of tobacco consumption

Vietnam has a high prevalence of tobacco consumption, especially concentrated among male smokers. According to the GATS, 45.3 percent of adult males and 1.1 percent of females—overall 22.5 percent of the population 15 years or older—were current smokers in 2015 (GATS 2015).¹ Despite lower prevalence rates, over half a million adult females and more than 50,000 children (10 to 14 years old) smoke everyday (Drope and Schluger 2018). Among youth, 6.9 percent of boys and 1.3 percent of girls (ages 13 to 15) are current tobacco users (WHO 2015).

Table 1. Consumption of tobacco products among adults in Vietnam, 2016

(adults, %)

	MALE	FEMALE	ALL
Tobacco Smokers			
Current tobacco smokers	45.3	1.1	22.5
Daily tobacco smokers	38.7	0.9	19.2
Cigarette Smokers			
Current cigarette smokers	36.7	0.8	18.2
Daily cigarette smokers	30.7	0.6	15.2
Waterpipe smokers			
Current waterpipe smokers	13.7	0.2	6.7
Daily waterpipe smokers	11.5	0.1	5.6

Source: GATS 2015. Note: Includes individuals aged 15 and older.

¹ The GATS is a globally standardized monitoring survey of adult tobacco use and tobacco control indicators. It has been collected in Vietnam in 2010 and 2015 (GATS Factsheet Vietnam 2015).

Several types of tobacco are regularly consumed in Vietnam, including cigarettes, waterpipe-smoking, and chewing tobacco. Cigarettes are the most common form of tobacco consumption, with 36.7 percent of men smoking cigarettes in 2015. Waterpipe-smoking is relatively popular, with a prevalence of 13.7 percent among adult men (Table 1).

Tobacco control and tax policies

Vietnam ratified the Framework Convention on Tobacco Control (FCTC) in 2004. The country has had a long history of policy concern and attempts to address high smoking prevalence. The first efforts in tobacco control were introduced in the early 1990s, including economic and noneconomic measures. An ambitious national tobacco control strategy introduced in 2000 aimed at cutting down tobacco use among adult males from 50 percent to 20 percent by 2010, while maintaining female smoking low, at a 2 percent rate (Cu Chi Loi 2008). Most recently, the National Strategy on Tobacco Control through 2020, launched in 2013, has set new smoking reduction targets, including a goal of a tobacco prevalence rate of 39 percent among adult males by 2020 (WHO, Vietnam Tobacco Control Fund, and HealthBridge Canada 2018).² Current tobacco-control policies include smoke-free laws in selected public spaces, cessation services, packaging regulation (graphic warnings), bans on advertising, and mass media anti-tobacco campaigns (Drope and Schluger 2018). Current discussions are under way on raising taxes on tobacco products as part of fiscal reform proposals (World Bank 2019a).

Tobacco taxation policies in Vietnam were also launched in the 1990s, with the introduction of an ad valorem special consumption (excise) tax on cigarettes. In 2006, the excise was unified across tobacco products.³ Currently, the excise rate on cigarettes and cigars is 75 percent of the pretax factory price for domestic tobacco products. A 10 percent value added tax (VAT) is levied on the retail price. And tobacco manufacturers and importers pay an additional 2 percent of the pretax ex-factory price, earmarked to finance the Fund for Prevention and Control of Tobacco (Law on Prevention and Control of Tobacco Harms). As of May 2019, the total tax rate for domestic cigarettes equaled 94.5 percent of the factory price (World Bank 2019a).⁴

² The target for youth (ages 15–24) is 18 percent tobacco prevalence by 2020; for women, it is 1.4 percent (WHO, Vietnam Tobacco Control Fund, and HealthBridge Canada 2018).

³ Initially, the excise was not applied uniformly to all types of cigarettes. Unfiltered cigarettes enjoyed substantial tax breaks (Guindon et al. 2010). Differential rates based on the origin of raw materials favored domestic brands (World Bank 2019a).

⁴ Imported cigarettes are subject to a 135 percent tax on the import price. The excise tax is levied on the post import tax base.

However, taxes on tobacco products remain low relative to international best-practice and regional peers. Despite several adjustments to raise tax rates over the past decades, effective tax burdens and retail prices remain low. Low tax rates and a purely ad valorem system contribute to Vietnam having some of the lowest tobacco prices in the western Pacific (WHO, Vietnam Tobacco Control Fund and HealthBridge Canada 2018). The tax-inclusive retail sales price (TIRSP) of a pack of 20 cigarettes of the most commonly sold brand (Craven A) was D 20,000 in 2016, only US\$2.20 adjusted for purchasing power parity (PPP).⁵ Total taxes on this brand accounted for 35.6 percent of the retail price. The effective tax rates on tobacco products in Vietnam are thus much lower than the global average of 56 percent and far below the WHO recommendations of 70 percent in excise taxes and 75 percent in total taxes. Within the Association of Southeast Asian Nations (ASEAN), Vietnam has lower average tax rates on tobacco than all other countries, excluding Cambodia and the Lao People's Democratic Republic (WHO, Vietnam Tobacco Control Fund and HealthBridge Canada 2018).

Affordability of cigarettes in Vietnam has increased over the past decades. A wedge emerged between rapidly increasing household incomes and decreasing real prices of cigarettes. Gross domestic product (GDP) per capita increased 80 percent in real terms between 1995 and 2006, while real prices declined 5 percent over the period (Guindon et al. 2010). Affordability of tobacco continued to increase between 2008 and 2016 (WHO 2017a, 2017b). Figure 1 illustrates the increasing gap in the evolution of real per capita incomes and tobacco prices between 2005 and 2016 for the case of the popular cigarette brand Vinataba. The WHO's relative income price (RIP) indicator—the share of income per capita required to purchase 100 packs of cigarettes—for Vinataba halved from 9 percent in 2005 to 4.3 percent in 2016 (WHO, Vietnam Tobacco Control Fund and HealthBridge Canada 2018). Under this measure, cigarettes became twice as affordable over only 11 years. Survey data of cigarette retailers collected in Hanoi and Ho Chi Minh City provided further evidence that real cigarette prices decreased between 2013 and 2016, despite the application of the Special Consumer Tax Act 70/2014 /QH13 (Ministry of Finance and HealthBridge Canada 2016).

Vietnam has achieved lackluster progress toward smoking reduction. The country still holds one of the highest smoking prevalence rates in the world. Evidence on recent changes is worrisome. Estimates from GATS showed that overall consumption of any

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⁵ The tax-inclusive retail sales price (TIRSP) of a pack of 20 cigarettes from the lowest-cost brand (Dulich A) was D 5,900 (or US\$0.77 PPP) in July 2016. This was less than one-quarter of the TIRSP for the premium brand (555 State Express), at US\$3.3 PPP (WHO 2017b).

Figure 1. Affordability of tobacco products in Vietnam, 2005-2016

Source: Authors calculations based on WHO, Vietnam Tobacco Control Fund and Health Bridge Canada (2018) and the World Development Indicators (WDI) database. * Retail price per pack (20 units) of Vinataba cigarettes.

tobacco products declined only 1.3 percentage points (non statistically significant) between 2010 and 2015. Statistically significant reductions were found in the prevalence of cigarette smoking (an 8.4 percentage point reduction) and hand-rolled cigarette smoking (38.3 percentage point decrease) over the five-year period. Progress has been particularly disappointing in rural areas of the country (Van Minh et al. 2015).

3

LITERATURE REVIEW

The negative causal impact of tobacco consumption on the health outcomes of individuals and their families has been long and extensively documented in the medical literature. Both active smoking and exposure to secondhand smoke cause disease and kill prematurely (Jha and Peto 2014). And it is estimated that 7 million people die from tobacco use every year globally (WHO 2015b, 2017c). Less knowledge is accumulated on the distributional effects of tobacco consumption and tobacco taxation policies on household welfare, especially in low- and middle-income settings.

Welfare and distributional impacts of tobacco

Several studies explore the effect of tobacco fiscal policy on poverty and inequality in Vietnam, based on microdata from household expenditure surveys. Cu Chi Loi et al. (2008) find evidence of regressive but negligible distributional effects of tobacco taxation policies. Household budget data for 2001–02 indicate the effect of the tobacco tax system on income inequality is not statistically different from zero at standard significance levels. Hoang, Nguyen et al. (2006) argue that forgoing cigarette consumption could help 11 percent of food-poor households overcome poverty. And they estimate that tobacco consumption increases inequality, causing the Gini coefficient to rise from 0.34 to 0.43 in Vietnamese urban areas and from 0.27 to 0.32 in rural settings. While these exercises highlight the relevance of tobacco expenses for lower-income households, they have several methodological caveats. Most importantly, they constitute static exercises that fail to incorporate the behavioral responses of consumers to the introduction of taxes.

Other studies simulate the welfare impact of increasing taxes on tobacco from an aggregate or macro perspective. Levy et al. (2006) use the SimSmoke model developed by the WHO to predict the effect of several tobacco control policies on consumption and premature mortality in Vietnam over a 30-year period. They simulate the effect of introducing different tax rates starting in 2004. Behavioral responses are introduced through price elasticities, which are assumed to increase (in absolute value) with age, but to be invariant across income groups and gender.⁶ Their results suggest that a 10 percent

⁶ Elasticities are assumed at –0.6 for the population under 24 years old, –0.5 for individuals ages 25–34, –0.4 for ages 35–44, and –0.3 for 45-years-old and above.

tax increase could reduce male and female smoking prevalence by 3.6 and 2.1 percent, respectively, and avert 1,386 premature deaths annually. A 100 percent tax rise could reduce the smoking prevalence by 24.5 percent among men and 14.5 among women, avoiding over 9,000 premature deaths every year.

Minh et al. (2018) estimate the health impacts of increasing cigarette taxes in Vietnam. Following the methodology of Jha et al. (2010), they simulate the potential reductions in tobacco consumption, smoking-attributable deaths averted and health-related cost savings. The model assumes an average price elasticity of demand for cigarettes of -0.25 and a price elasticity of initiation of smoking at -0.15 .⁷ Five policy scenarios for the change in ad valorem and specific taxes by 2021 are considered. Results suggest that increasing cigarette taxes would yield substantial health impacts and financial savings in Vietnam. Potential young smokers would observe the largest benefits of the increase. The ideal policy scenario recommended by the WHO—implying a price increase by 563 percent—could prevent an estimated 6.2 million to 12.3 million smoking-attributable deaths, while averting mortality costs of US\$57 billion to US\$112 billion.

The methodology of Minh et al. (2018) highlights the different mechanisms through which tobacco consumption affects health and financial outcomes in Vietnam and assesses the potential cost savings (or benefits) that arise from raising taxes. Nonetheless, their methodology does not incorporate the premise that raising taxes can also impose welfare losses in the short term on smokers and their households, as a continuation of tobacco purchases would imply a reduction in household disposable incomes. Acknowledging this, the ECBA methodology seeks to weigh the costs and the benefits of increasing taxes on tobacco on household welfare and to understand smoker adjustments when facing higher tobacco prices. Another general caveat of these simulations is the use of a single elasticity parameter across all income groups. This precludes a deeper understanding of the behavioral responses to taxes on tobacco of different groups of the population, and it can mask distributional effects and policy implications for poor and vulnerable households. Moreover, the parameters used in the model are based on international evidence gathered by the WHO, rather than on empirical findings for Vietnam. To the knowledge of the authors of this report, no previous estimation is available on the price elasticities of tobacco for different income deciles in Vietnam.

⁷ The authors explain that the assumption for price elasticity of demand derives from discussions with the WHO and the Ministry of Finance. The initiation elasticity is taken from the review of the literature by Wilson et al. (2012). Additionally, the cigarette-related mortality rate and quitting rate are assumed at 30 percent or 50 percent for different simulations, and the cost per cigarette death is US\$9,600.

The ECBA on the distributional impact of tobacco taxation policies originates in the literature that has long sought to understand and quantify the social and economic costs of smoking. An extensive array of methodologies to estimate these costs has nonetheless faced important conceptual and empirical challenges (see Lightwood et al. 2000 for a detailed discussion). More recently, Verguet et al. (2015) and Pichon et al. (2014) developed ECBA methodologies to quantify the distributional effects of increasing taxes on tobacco. Their models apply a conceptual framework based on the literature (explained in section 4) to account for both direct costs and indirect benefits of increasing taxes on tobacco for households. They leverage available expenditure data and other empirical estimates to calculate the income changes derived from a tax increase for different income deciles of the population.

The ECBA methodology has been adapted and applied to a variety of empirical studies by the World Bank in low-, middle-, and higher-income countries. Evidence from Bangladesh, Bosnia and Herzegovina, Chile, Indonesia, Moldova, the Russian Federation, South Africa, and Ukraine have consistently dismissed the arguments of regressive effects of increasing taxes on tobacco (see Fuchs and Del Carmen 2018; Fuchs, Del Carmen, and Mukong 2018; Fuchs and Matytsin 2018; Fuchs and Meneses 2017a, 2017b, 2018; Fuchs, Orlic, and Cancho 2019). Findings across these countries suggest that increasing taxes on tobacco is non-regressive, with the potential for large price shocks to induce progressive effects and net welfare gains. Under relatively high-elasticity scenarios, simulations of the ECBA show net positive effects, with the higher (relative) benefits accumulating on the lower side of the income distribution. This indicates the possibility for long-term redistribution and net welfare improvements from increases in tobacco taxes. Other variations of the ECBA methodology have been applied in Armenia (Postolovska et al. 2017), Colombia (James et al. 2017), and the Kyrgyz Republic (Postolovska et al. 2018), with similar insights on the net benefits of increasing taxes on tobacco products.

Price elasticity of demand

The distributional impact of raising taxes on tobacco depends fundamentally on the responsiveness of low- and high-income consumers to the price changes in tobacco (WHO 2011a). Price elasticities of demand express this responsiveness or sensitivity of consumers to price changes. While the addictive properties of tobacco products result in smaller (more inelastic) reductions of smoking in response to price changes, the magnitude and distribution of these reductions remain an empirical question.

The literature has generally estimated the price elasticity of demand for cigarettes among adults at between -0.3 and -0.8 (CBO 2012; Chaloupka and Warner 2000; Gallet and List 2003; IARC 2011). Moreover, price elasticities vary across countries and, within them, across income and other population groups. Demand for tobacco tends to be more price responsive (less price inelastic) for lower-income households and for older members of the population (Jha and Peto 2014). The impact of prices on tobacco consumption is expected to increase in the future as more-responsive young generations become the largest consumer group (Fuchs and Del Carmen 2018).⁸

The recent empirical estimations of tobacco price elasticities by income deciles show that, even though poor households generally have higher rates of smoking, they are also more sensitive to price changes in tobacco, reducing consumption more than richer peers when faced with similar price shocks. This has been shown in recent estimations based on household survey data from a variety of countries, including Bangladesh, Bosnia and Herzegovina, Chile, Indonesia, Moldova, Russia, and Ukraine. (Fuchs and Del Carmen 2018; Fuchs, Del Carmen, and Mukong 2018; Fuchs and Matytsin 2018; Fuchs and Meneses 2017a, 2017b, 2018; Fuchs, Orlic, and Cancho 2019).⁹

The available analyses find a negative and significant association between tobacco prices and consumption in Vietnam, although the estimated magnitudes vary considerably across studies. In a meta-analysis of 25 empirical studies, Guindon et al. (2010) find that the price elasticity of demand for cigarettes in Vietnam is likely below -0.50 in magnitude. Several studies, including Guindon et al. (2010), leverage cross-sectional individual-level data and two-stage models to estimate participation in smoking and conditional price elasticities. Results across studies vary substantially, with elasticities of participation estimated between -0.02 and -0.20 and conditional elasticities of demand from -0.06 to -0.30 (Guindon et al. 2010).

Eozenou and Fishburn (2007) use cross-sectional household survey data and apply Deaton's (1990) method of an almost ideal demand system. If households simultaneously choose the quantity and quality of tobacco purchases, the unitary price values—typically observed in household survey data—reflect both decisions. The almost ideal demand

⁸ Lower dependence on nicotine, larger peer effects, and lower disposable income may cause younger people to be more responsive to tobacco price shocks (Jha and Peto 2014).

⁹ The negative association of income and price elasticities is not monotonic in all cases. For example, in South Africa, the higher elasticity parameters were found in deciles one and five. In some applications for Indonesia, the association follows a u-shape, with middle-income households showing the highest quantity responses to price changes.

system uses spatial variations in prices to disentangle the quality choice from the exogenous price variations in the observed unitary values. Using this methodology, the authors estimate the price elasticity of demand for cigarettes in Vietnam at -0.53 .

Laxminarayan and Deolalikar (2004) study the impact of prices on the probability of quitting or initiating cigarette and waterpipe smoking, using data from the 1992–93 and 1997–98 rounds of the VHLSS. They estimate the price elasticity of cigarette initiation at -1.175 . However, they find that changes in the price of cigarettes do not have a significant statistical effect on the probability of quitting. In line with concerns in the literature of possible substitutability effects across types of tobacco products, the authors argue that higher prices of cigarettes may divert consumption toward lower-priced rustic tobacco, rather than encourage quitting.

Limited availability of household or individual data on tobacco consumption restricts the possibility to estimate and update the calculations of price elasticities of tobacco to more recent years in Vietnam.¹⁰

Health and economic costs of tobacco

The negative health effects of tobacco consumption translate to billions of dollars in medical bills and productivity losses that burden households and public budgets (NCI and WHO 2016; Xu et al. 2015). Globally, the burden of tobacco-related health care expenses was estimated at US\$422 billion in 2012 (Goodchild, Nargis, and Tursan d’Espaignet 2018). The total economic cost of smoking—including health care expenditures and productivity losses—is estimated at over US\$1.4 trillion per year, or 1.8 percent of global GDP (Goodchild, Nargis, and Tursan d’Espaignet 2018).

In Vietnam, some exercises show that tobacco-related medical expenses are significant. Ross et al. (2007) analyze the costs of hospitalization for three smoking-related diseases— ischemic heart disease, lung cancer, and chronic obstructive pulmonary diseases— surveyed in Hanoi’s major hospitals. Considering these diseases, they estimate that smoking was responsible for 4.3 percent of total health care inpatient expenditures or 0.22 percent of GDP in 2005. The public sector finances 51 percent of these costs, while households pay out-of-pocket (OOP) for 34 percent, and the insurance sector bears 15 percent of the costs.

¹⁰ The VHLSS questionnaire collects information on household expenditures on tobacco products. However, after 1997–98, data were not collected on quantities or prices for tobacco, and different types of tobacco cannot be disaggregated. See Annex B for details.

Productivity losses come from premature deaths and increased morbidity related to smoking. Tobacco consumption is the major cause of noncommunicable diseases in Vietnam, which account for the largest share of mortality and morbidity in the country. Guindon et al. (2010) apply the methodology of Ranson et al. (2002) to estimate the impact of increasing cigarette prices on tobacco-related deaths in the 2005 cohort of the Vietnamese population. Assuming a lower-bound elasticity of -0.25 , they find that raising cigarette prices by 33 (70) percent could reduce tobacco-related deaths by 170,000 (360,000) people by 2050. They also estimate that, as a secondary benefit, a specific tax of D 1,750 (US\$0.11) per pack of 20 cigarettes (indexed to inflation) could increase tax revenues by D 4.3 trillion (US\$268 million) every year.

Hoang et al. (2016) calculate the total economic losses attributable to smoking, incorporating both direct medical expenses and productivity losses. They apply the cost of illness approach to estimate the direct medical costs from five smoking-related diseases—lung cancer, cancers of the upper aerodigestive tract, chronic obstructive pulmonary disease, ischemic heart disease, and stroke—and a human capital approach to value indirect costs from smoking-related morbidity and mortality. The total health costs of smoking in 2011 are estimated at D 25 trillion or close to 1 percent of GDP. The direct costs of inpatient and outpatient care reached D 10 trillion and D 3 trillion, respectively. The government's contribution to the direct health costs accounted for 6 percent of the 2011 national health care budget. The smoking-attributable indirect costs are calculated as the productivity losses from morbidity and mortality, and they account for the remaining 49.5 percent of the total economic burden of smoking.

As part of their cross-country comparative exercise, Goodchild et al. (2018) estimate that smoking-related direct medical costs in Vietnam amounted to D 9.7 trillion (or US\$1.3 billion PPP) in 2012.¹¹ However, that was only a fraction (12 percent) of the total economic burden of tobacco in Vietnam, estimated at D 84.6 trillion (or US\$11.6 billion PPP), and equivalent to 2.6 percent of GDP.

¹¹ This calculation is based on a 5 percent smoking attributable fraction, based on the previous work of Hoang et al. (2016) and Ross et al. (2007).

4

THE EXTENDED COST-BENEFIT ANALYSIS MODEL

The ECBA model was adapted and applied to several country studies by Fuchs and Meneses (2017a, 2017b, 2018), based on previous work by Pichón-Riviere et al. (2014) and Verguet et al. (2015). Equation (1) describes the three components of the model. Methodological details for each component are described in Annex A.

This ECBA methodology provides two main contributions to the literature on the welfare effects of tobacco taxation. First, it incorporates decile-specific price elasticities. The naive assumption of direct pass-through—where households are assumed to keep consumption unchanged—can be analyzed as a theoretical case within the model. In reality, however, consumers adjust quantity choices when faced with a higher price, attenuating the negative price shock on their budgets and giving rise to a number of health and economic benefits discussed below. Moreover, the model allows different income groups to respond differentially to the price changes, as suggested by the literature.

Second, following the extensive medical and economic literature, the ECBA methodology aims to implement empirically a more comprehensive understanding of the health and economic consequences of reducing tobacco consumption. As individuals cut down smoking, they reduce the need for medical treatment and gain—or rather stop losing—healthy years of life. These positive health effects translate to lower medical expenses and higher earnings potential, that may work to offset the direct negative shocks of a price increase on household budgets.

The overall welfare effect is measured as a change in household incomes, resulting from adding the costs and benefits in components (A), (B), and (C), as described in equation (1). The distributional incidence analysis then compares the average welfare changes (relative to initial incomes) for the different deciles in the population.

Equation 1. Components of the Extended Cost Benefit Analysis

$$\text{Net Income Gains} = - \text{Increased tobacco expenditure (A)} + \text{Reduced medical expenses (B)} + \text{Additional years of productive life (C)} \quad (1)$$

The net effect of increasing tobacco taxes on household income is thus dependent on the competing magnitudes of benefits and costs. And, ultimately, the overall welfare and distributional impact of changes in tobacco taxation policies will be a function of the price change (ΔP_t), the magnitude and distribution of price elasticities across income groups (ϵ_d), the initial shares of tobacco consumption in household budgets ($w_{t,i}$), and the negative health effects of tobacco that are reflected in avoidable medical expenses ($Med_{t,i}$) and premature years of life lost ($YLL_{t,i}$).

$$\Delta W_{t,i} = \Delta w_{t,i} + \Delta Med_{t,i} + \Delta YLL_{t,i}, \quad (2)$$

$$\Delta W_{t,i} = f(\Delta P_t, \epsilon_d, \omega_{t,i,d}^0, YLL_{t,i}, Med_{t,i}) \quad (3)$$

The following section describes the data sources used to estimate the parameters in equation (3) to be able to implement each component of the ECBA in the case of Vietnam.

5

DATA SOURCES AND DESCRIPTIVE STATISTICS

The ECBA model is applied on household expenditure data from the VHLSS 2016. Given data limitations on the prices and quantities of household tobacco purchases, decile-specific price elasticities of demand are calculated using the 1997–98 round of the VHLSS. Annex B describes the data sources used in the analysis for Vietnam, including the VHLSS and the GATS.

Table 2 presents basic descriptive statistics of tobacco consumption from the VHLSS 2016, disaggregated by decile. Income deciles are constructed based on the per capita household consumption aggregate, as the best available proxy to income level. Prevalence of tobacco consumption [defined as the share of households reporting positive expenditures on tobacco products] is highest for the bottom 40 percent of the income distribution. The difference with the highest income households is striking. While only 45 percent of the richest 10 percent of households smoke, on average, 62 percent of the poorest 40 percent smoke according to this definition. Moreover, the share of tobacco expenses in total household budgets is 2.5 times more significant among the poorest 10 percent of households relative to the wealthiest 10 percent.

The VHLSS 2016 and GATS 2015 are consistent at the aggregate level. The Vietnamese population spends D 31 trillion annually in cigarette purchases (current prices) according to the GATS and D 33 trillion according to the VHLSS (2016 prices). The VHLSS household expenditure data suggest that smoking comes mostly (99 percent) from purchased tobacco, while self-production and gifted tobacco is not significant.

Table 2. Basic descriptive statistics, VHLSS 2016

DECILE	HOUSEHOLD SIZE	HOUSEHOLD HEAD AGE	HOUSEHOLD HEAD FEMALE	SHARE OF SMOKERS ^A	TOBACCO EXPENDITURE PER CAPITA, ANNUAL, D	TOBACCO EXPENDITURE PER CAPITA, ANNUAL, US\$ PPP	SHARE OF TOBACCO PURCHASED IN HOUSEHOLD CONSUMPTION ^B	HOUSEHOLD CONSUMPTION PER CAPITA, ANNUAL, D, 1,000\$	HOUSEHOLD CONSUMPTION PER CAPITA, ANNUAL, US\$ PPP
1	4.8	47.3	19.9%	61.0%	140,194	15	1.65%	8,630	952
2	4.3	51.0	21.2%	61.5%	216,452	24	1.56%	13,804	1,523
3	4.1	52.7	23.8%	61.2%	275,014	30	1.57%	17,567	1,938
4	3.9	53.0	22.6%	63.7%	297,037	33	1.41%	21,104	2,329
5	3.8	52.3	22.2%	60.9%	339,794	37	1.38%	24,778	2,734
6	3.7	51.6	24.2%	59.8%	344,035	38	1.19%	29,020	3,202
7	3.6	52.4	24.2%	59.5%	414,420	46	1.21%	34,423	3,798
8	3.6	51.9	24.6%	58.4%	414,992	46	1.00%	41,895	4,623
9	3.4	52.9	32.5%	54.0%	494,844	55	0.93%	54,403	6,003
10	3.2	54.3	37.4%	45.7%	578,148	64	0.65%	100,263	11,063
Population	3.8	52.1	25.7%	58.2%	342,378	38	1.28%	34,596	3,817

Source: Vietnam Household Living Standards Survey 2016; World Development Indicators for PPP conversion.

Note: Deciles are created based on per capita household consumption.

a. Households are classified as smokers if they report positive expenses in tobacco products.

b. Conditional shares of tobacco in total household consumption.

6

PRICE ELASTICITIES OF TOBACCO IN VIETNAM

The price elasticities of demand for tobacco products are calculated based on data from the VHLSS 1997–98. This round of the VHLSS is the only one that includes information on quantities and prices of tobacco-related products, as an additional module was specifically designed for this round. Annex C includes details on the specification of the empirical model.

Figure 2. Estimates of price elasticity of demand for tobacco products

Source: Estimates based on data of the VHLSS 1997–98.

Figure 2 shows that the demand becomes more inelastic as household income increases. In contrast, poorer households are more likely to reduce the quantity of tobacco consumed as prices increase.

After empirically estimating the medium-bound elasticities, lower- and upper-bound elasticities are defined at values above and below 0.2 from the medium-bound scenario. All elasticity scenarios for Vietnam are thus within (or close to) the range of –0.8 to –0.3 that is commonly found in meta-analyses of the price elasticity of tobacco among adults

(Fuchs et al. 2019).¹² Because price elasticities are expected to increase with younger cohorts, the upper-bound scenario may be interpreted as a long-term outcome, while the lower-bound elasticity may be a best interpretation of short-term behaviors.¹³

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¹² Meta-analyses commonly find the estimates for the price elasticity of demand to lie between -0.3 and -0.8 (CBO 2012; Chaloupka and Warner 2000; Gallet and List 2003; IARC 2011, cited in Fuchs et al. 2019).

¹³ Peer effects, lower nicotine dependence, and less disposable incomes may cause younger people to be more responsive to tobacco price shocks (Jha and Peto 2014).

7

MORTALITY, MEDICAL EXPENSES, AND YEARS OF PRODUCTIVE LIFE LOST

Mortality

Data on death events related to the risk of smoking in Vietnam are taken from the Global Burden of Diseases (GBD) database. Premature deaths from secondhand smoke or chewing tobacco are not considered in this exercise. Table 3 disaggregates the mortality statistics by cause and sex. Almost 85,000 people died in Vietnam from smoking-attributable diseases in 2016. Males accounted for 94 percent of these deaths. Strokes, tracheal bronchus, and lung cancer were the most common causes in smoking-related premature deaths. Death events attributable to smoking accounted for 14 percent of mortality from all causes in Vietnam.

Arguably, these mortality figures represent a medium-bound estimate. Levy et al. (2006) calculate 40,000 tobacco-related deaths each year in Vietnam, with a rising trend. The American Cancer Society estimates that number at 134,300 people killed by tobacco-caused disease every year (Drope and Schluger 2018).

Medical expenses

Up-to-date estimates of the medical costs related to tobacco-attributable diseases in Vietnam were not found in either the literature or public records. An initial calculation of the tobacco-related direct medical expenses was performed based on the cost-of-illness approach used for 2011 by Hoang et al. (2016).¹⁴ The following parameters were updated and used: the unitary cost data used by Hoang et al. (2016) (updated based on the consumer price index), the smoking prevalence rates for men and women (using the GATS 2015), and the total number of inpatient and outpatient treatment cases by disease (based on 2015 data from the Statistical Book of the Ministry of Health).¹⁵ Additionally, relative risks (RR) ratios

¹⁴ Hoang et al. (2016) leverage 2011 data on inpatient and outpatient medical treatment costs collected for five tobacco-related diseases (lung cancer, upper aerodigestive tract cancers, COPD, ischemic heart disease, and stroke). The sample included 3,128 patients who received treatment in thirteen Vietnamese public hospitals. The data were collected between March and October 2011.

¹⁵ Le Thi Thu and HealthBridge Canada provided the valuable inputs and methodological steps for this exercise.

Table 3. Death events attributable to the risk of smoking, Vietnam 2016

DISEASE	MALES	FEMALES	ALL
Aortic aneurysm	393	19	412
Asthma	900	53	953
Atrial fibrillation and flutter	82	8	91
Bladder cancer	320	11	331
Breast cancer		30	30
Cervical cancer		29	129
Chronic obstructive pulmonary disease	10,266	721	10,986
Colon and rectum cancer	1,123	77	1,200
Esophageal cancer	1,186	32	1,218
Ischemic heart disease	12,428	763	13,191
Kidney cancer	71	3	74
Larynx cancer	908	8	916
Leukemia	517	32	549
Lip and oral cavity cancer	872	71	943
Liver cancer	2,377	49	2,426
Lower respiratory infections	2,798	173	2,971
Multiple sclerosis	15	1	16
Nasopharynx cancer	489	5	495
Other pharynx cancer	998	23	1,021
Pancreatic cancer	336	52	388
Peripheral artery disease	17	1	19
Prostate cancer	200		200
Rheumatoid arthritis	13	1	14
Stomach cancer	1,083	39	1,122
Stroke	17,976	852	18,829
Tracheal, bronchus, and lung cancer	16,573	893	17,465
Upper digestive system diseases	101	9	110
Other attributable	7,883	675	8,558
(a) Subtotal attributable	79,924	4,731	84,655
(b) Other not attributable	262,894	246,470	509,364
(a) + (b) All deaths	342,819	251,201	594,020

Source: GBD 2019. Data downloaded in June 2019.

were taken from the CPS-II and used to calculate the smoking-attributable fractions for the five tobacco-related diseases under consideration.¹⁶ Based on this methodology, the national aggregate tobacco-related medical expenses were estimated at D 17.5 trillion.

An alternative estimation considered strictly the fraction of tobacco-related medical expenses that are paid OOP by households. According to recent work by the World Bank, despite the expansion in health insurance coverage over the last two decades and significant increases in fiscal spending on health services, OOP payments continue to finance a large share of Vietnam's health care system (Teo et al. 2019). The estimated share of OOP payments in total health expenditures in Vietnam—43 percent—is applied to the estimation above, to obtain a total of D 7.5 trillion in direct medical expenses paid OOP.

A third estimation updated the findings of Goodchild et al. (2018) for Vietnam, assuming that medical expenses have remained constant since 2012 in real terms.¹⁷ The original estimate by Goodchild et al. (2018) is based on a linear regression to predict the smoking-attributable fractions of health care expenditures across 152 countries.

Table 4. Estimation Scenarios of tobacco-related direct medical expenses

	DESCRIPTION	ESTIMATE	METHODOLOGY
(1)	Baseline estimate (OOP only)	D 7.5 trillion	Considering only the share of OOP payments, based on scenario (3) and Teo et al. (2019)
(2)	Total health care expenditures (cost-of-illness approach, from cross-country regression)	D 11.3 trillion	Predictions for 2012 by Goodchild et al. (2018), updated for changes in the consumer price index
(3)	Public and private costs (cost-of-illness approach, with hospital costs in Vietnam)	D 17.5 trillion	Adapted from the 2011 calculations and methodology by Hoang et al. (2016), using data from the GATS 2015, Ministry of Health, CPS-II and the consumer price index

Source: World Bank calculations.

Table 4 summarizes the three alternative estimation scenarios. Scenario (1)—considering OOP expenses only—is taken as the baseline estimate because of its most direct incidence on household budgets and welfare. All simulation results are first estimated for this baseline scenario. Estimates (2) and (3) are helpful in expressing the overall fiscal and social costs from tobacco-related medical expenses. They convey the societal losses from financing treatment to tobacco-related medical expenses that ultimately represent an opportunity cost to improve household welfare. They are also better approximations

¹⁶ Cancer Prevention Study (CPS) II, performed by the American Cancer Society.

¹⁷ The estimation by Goodchild et al. (2018) for 2012 is adjusted to 2016 prices, using changes in the consumer price index. In 2016 prices, the total medical expenses add up to D 11.3 trillion or US\$1.3 billion PPP. This is a conservative estimate, since health expenditures tend to rise with income.

to medium- and long-term medical expenses faced by households, assuming that growing incomes, shifting demand patterns, and demographic changes will raise tobacco-related and overall medical expenditures in Vietnam. In all cases, the estimated direct medical expenses in Vietnam are distributed across income deciles in proportion to the share of smokers in each decile.¹⁸

Years of productive life lost

The years of productive life lost are calculated based on the mortality data from the GBD. Given the emphasis of the ECBA model on household earnings, death events are only considered for individuals up to the age of 65, assumed as an average retirement age. Table 5 summarizes these estimations.

Table 5. Calculation of years of life lost, by age-group and gender, 2016

AGE GROUP	SMOKING-RELATED DEATH EVENTS			YEARS OF PRODUCTIVE LIFE LOST		
	MALES	FEMALES	ALL	MALES	FEMALES	ALL
30 to 34	403	7	410	13,296	224	13,520
35 to 39	800	13	812	22,391	354	22,745
40 to 44	1,796	33	1,829	41,309	750	42,059
45 to 49	3,907	66	3,973	70,335	1,188	71,523
50 to 54	7,275	187	7,462	94,579	2,427	97,006
55 to 59	10,297	288	10,585	82,377	2,304	84,681
60 to 64	12,037	472	12,509	36,111	1,417	37,528
All < retirement	36,515	1,065	37,581	360,396	8,665	369,062
All > retirement	43,409	3,666	47,075			
Total	79,924	4,731	84,655	360,396	8,665	369,062

Source: Calculations based on data from the GBD 2019. Data downloaded in June 2019.

Note: Retirement is assumed at age 65 for males and females. Only death events related to the risk of smoking are considered, while the risks of secondhand smoke and chewing tobacco are not.

The total years of productive life lost attributable to smoking tobacco are estimated at 369,062 years in 2016. Premature deaths among males start as early as ages 30–34. And they account for 98 percent of the total smoking-attributable YLL in Vietnam. It is worth noting that 56 percent of all smoking-related deaths in Vietnam occur after the age of 65. These deaths are not incorporated in the years of productive life lost considered in the ECBA. But they represent additional high economic and societal losses for Vietnam.

¹⁸ Households are assumed to smoke if they report positive expenditures on tobacco products in the VHLSS 2016.

8

SIMULATION SCENARIOS

Several simulations are tested to assess the effect of raising taxes on cigarettes in Vietnam. Simulations are based on four price shock scenarios: a price increase on cigarettes of 8 percent, 24 percent, 40 percent, and 80 percent. These scenarios were identified for their relevance and practical application to the current research and policy reform agenda in Vietnam.

A single price increase of 8 percent would be roughly equivalent to imposing an additional D 1,000 specific excise per pack of a mid-range brand of cigarettes.¹⁹ This is thus representative of a lower-bound (or minimum) tax increase scenario currently under discussion. The price increases of 24 percent and 40 percent are equivalent to the proposals to increase the excise by D 3,000 and D 5,000, respectively (also assuming the mid-range brand as a price base). Finally, an 80 percent price increase can approximate the proposal to increase the excise by D 2,000 every year over the next five years. These four scenarios are described in Table 6 as homogeneous price shocks affecting the entire population.

In a second series of simulations, it is hypothesized that households will be differentially affected by the new specific excise on cigarettes. Because the specific excise represents a higher burden on lower-priced cigarettes packs, households purchasing cheaper brands would face a higher percentage price shock. It is assumed that lower-income households purchase cheaper cigarettes, given their more limited disposable incomes. Given information on market shares of cigarette brands, it is hypothesized that the 40 bottom percent of the income distribution consumes economy brands only; deciles 5 to 8 purchase mid-price cigarettes only; and smokers in the richest 20 percent of the population buy premium brands only. Using the average prices for the three types of cigarette brands, the four policy proposals (D 1,000, D 3,000, D 5,000, and D 10,000) are translated to the decile-specific price shocks described as heterogeneous shocks in Table 6.

¹⁹ Patricio V. Marquez, Mark Goodchild, Caryn Bredenkamp, and Paul Isenman contributed insights and inputs for the development of this methodology and the estimation of policy scenarios.

Table 6. Summary of policy scenarios considered in ECBA simulations

PRICE SHOCK SCENARIO	POPULATION GROUP	POLICY SCENARIO: EXCISE INCREASE EQUIVALENT				CIGARETTE BRAND ASSUMED
		D 1,000 (A)	D 3,000 (B)	D 5,000 (C)	D 10,000 (D)	
(1) Homogeneous	National	8%	24%	40%	80%	N/A
(2) Heterogeneous	Decile 1	13%	39%	65%	130%	Economy
	Decile 2	13%	39%	65%	130%	Economy
	Decile 3	13%	39%	65%	130%	Economy
	Decile 4	13%	39%	65%	130%	Economy
	Decile 5	7%	21%	35%	70%	Mid-price
	Decile 6	7%	21%	35%	70%	Mid-price
	Decile 7	7%	21%	35%	70%	Mid-price
	Decile 8	7%	21%	35%	70%	Mid-price
	Decile 9	3%	9%	15%	30%	Premium
	Decile 10	3%	9%	15%	30%	Premium

Source: Calculations based on policy discussions held with World Bank, WHO, and academic experts, and Vietnamese government officials in 2019.

Note: Percentage shocks are calculated based on policy scenarios discussed with experts and data from cigarette market shares and pricing from WHO and World Bank 2019a. The D 10,000 excise may be interpreted as an annual excise increase of D 2,000 over a five-years period.

9

RESULTS

Each component of equation (1) of the ECBA is simulated using data from the VHLSS 2016 under the four policy scenarios. First, the single (homogeneous) price shock scenarios are explored. The second section of results is based on the heterogeneous (decile-specific) shocks. While the last section explores the incidence of these price changes on poverty changes and averted premature deaths in Vietnam.

All simulations in this section assume the conservative baseline estimate of tobacco-related OOP medical expenses (D 7.5 trillion). Additional robustness checks based on the alternative estimates of medical expenses are presented in Annex D, without relevant changes in the main results and takeaways.

9.A. Results assuming a homogeneous price shock

Increased tobacco expenditures

Increasing the prices on tobacco products, while holding cigarette smoking constant, has a mechanic and immediate negative financial effect on all households, as they are forced to allocate a higher share of their budgets to continue to purchase the same quantities of tobacco. This scenario is known as direct pass-through (solid line in Figure 3). Because tobacco purchases represent a higher share of household budgets among lower-income households, the direct pass-through effect is regressive. The positive slope of the incidence curve (suggesting the regressive effect, with a more negative shock to poorer households) increases with the magnitude of the price shock (from panel a to panel d).

In reality, however, households adjust consumption when faced with higher prices. As explained above, it is the interaction of the price shock, the responsiveness of each group of the population—incorporated as price elasticities—and the share of tobacco in household budgets that will determine the increase in tobacco expenditures. Figure 3 presents these results with dotted lines for different price elasticity assumptions. Assuming a small or moderate price increase (panels a to c), the effect is still negative across the population and somewhat regressive, although its magnitude and regressivity are more moderate than under direct pass-through (and decreasing with elasticity). However, for large enough elasticities and price shocks (such as the upper-bound elasticities in panel d), it is possible to observe positive and progressive price effects. This illustrates that, as tobacco becomes more unaffordable and smokers more responsive to

price changes in the long term, households cut down on tobacco consumption enough to free budget resources for other uses. Because lower-income households observe the largest shifts away from tobacco, this positive pattern is also progressive.

Figure 3. Effect of increasing tobacco expenditures, homogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016 and elasticity calculations from the VHLSS 1997–98.

Note: Deciles are created based on per capita household consumption.

Reduced medical expenses

The panels on Figure 4 isolate the effect of increasing prices on tobacco by reducing the tobacco-related direct medical expenses in Vietnam. The entire population benefits from positive income gains, as the price shock encourages consumers to reduce smoking. The effect is highly progressive. Lower-income households in Vietnam are more often smokers, and the costs of medical treatment for tobacco-related illness represent a large share of their budgets. Hence, they also capture the highest (relative) benefits of taxing tobacco

to reduce medical expenses. In the long term, high increases in tobacco taxes (panel d) could prevent annual OOP medical expenses that represent almost 0.5 percent of income for the bottom 20 percent of the income distribution.

Figure 4. Effect of reducing medical expenses, homogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016 and elasticity calculations from the VHLSS 1997–98.
 Note: Deciles are created based on per capita household consumption. Medical expenses include OOP expenses only, assumed at D 7.5 trillion (see Table 4 for methodological details).

Change in productive years of life lost

Results from the simulations on the change in years of productive life lost are presented in Figure 5. The curves show no evident pattern of either regressive or progressive effects. As compared to decreasing the tobacco-related medical expenses, reducing the productive YLL seems to yield much lower welfare gains for all households in Vietnam. Under the medium- and upper-bound elasticity scenarios, the poorest 10 percent and the wealthiest 20 percent of the population attract lower (relative) benefits than other deciles.

Figure 5. Effect of reducing the years of productive life lost, homogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016 and elasticity calculations from the VHLSS 1997–98. Data on smoking-attributable death events are taken from the GBD 2016.

Note: Deciles are created based on per capita household consumption.

Net income effect

The net income effect (Figure 6) is calculated by adding the individual components [(A)+(B)+(C)], according to equation 1 of the ECBA. The four price shock scenarios show evidence that the benefits of increasing prices on tobacco can act to offset the costs in household welfare. For high-enough price shocks or elasticity scenarios, the benefits outweigh the direct costs, resulting in net, albeit small positive income effects for most Vietnamese households. However, under lower responsiveness to price changes in the short term (the lower-bound elasticities), the net effects continue to be negative across the population, regardless of the magnitude of the price change.

Although the distributional impact is relatively flat (similar for all households as a percentage of income and thus higher for wealthier households in absolute terms), the distribution becomes somehow progressive as the price shock and elasticities increase.

Figure 6. Net income effect, homogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016 and elasticity calculations from the VHLSS 1997–98.
 Note: Deciles are created based on per capita household consumption. Medical expenses include OOP expenses only, assumed at D 7.5 trillion (see Table 4 for methodological details).

9.B. Results assuming heterogeneous (decile-specific) price shocks

Increased tobacco expenditures

There are negative and regressive direct price effects of increasing the specific excise on cigarettes (regardless of elasticity assumptions) under the low and moderate price shock scenarios (panels a to c). It is only for the combination of substantial price responsiveness and large price shocks (upper-bound elasticity in panel c and medium- and upper-bound elasticities in panel d), that the price shock can induce the freeing up of resources from cigarettes in a progressive pattern. Unlike the case of a single homogeneous price shock, panels c and d in Figure 7 demonstrate that, for the same price shock configuration, the reaction of smokers (the magnitude of the price elasticities) can drastically influence whether the result is negative and regressive or somewhat positive and progressive.

Figure 7. Effect of increasing tobacco expenditures, heterogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016 and elasticity calculations from the VHLSS 1997–98.

Note: Deciles are created based on per capita household consumption. Medical expenses include OOP expenses only, assumed at D 7.5 trillion (see Table 4 for methodological details).

Reduced medical expenses

As expected, the reduction in OOP medical expenses is positive across the population, with a similar progressive pattern as the homogeneous (single) price shock scenario. However, because lower-income households are more likely to reduce smoking due to larger price shocks, they also capture higher relative benefits from reducing tobacco-related medical bills. Hence, incidence becomes more progressive in all panels—as observed from the steeper negative slopes in Figure 8—relative to a single price shock for all households (see Figure 4).

Figure 8. Effect of reducing medical expenses, heterogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016 and elasticity calculations from the VHLSS 1997–98.

Note: Deciles are created based on per capita household consumption. Medical expenses include OOP expenses only, assumed at D 7.5 trillion. See Table 4 for methodological details.

Change in productive years of life lost

The simulation of the additional earnings from averting smoking-related years of productive life lost show positive and progressive patterns in all panels of Figure 9. The first to third deciles observe similar (relative) income gains. For the rest of the population, the relative gains decrease consistently with income. Similar to the case of medical expenses, the negative slope of the incidence curves (and the magnitude of the results relative to Figure 5) suggests that lower-income households benefit from changing their smoking behavior more dramatically, as a result of more elastic demand for cigarettes and larger price shocks.

Figure 9. Effect of reducing the years of productive life lost, heterogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016 and elasticity calculations from the VHLSS 1997–98.

Note: Deciles are created based on per capita household consumption. Medical expenses include OOP expenses only, assumed at D 7.5 trillion (see Table 4 for methodological details).

Net income effect

Figure 10 illustrates the distribution of net income changes across deciles. Assuming medium- or higher-bound elasticities (suggestive of medium- and long-term outcomes), the moderate to high price shocks (panels b, c, and d) yield nonnegative income gains among all Vietnamese households. The distribution of the net benefits is highly progressive. Poor households capture relatively large income gains that naturally increase with the magnitude of the price shock. Increasing the excise tax by D 10,000 could bring income gains of over 1.5 percent to the poorest 30 percent of the population. The effect among the top four deciles would be closer to zero under all scenarios.

Figure 10. Net income effect, heterogeneous price shock

Source: Estimates based on household expenditure data from the VHLSS 2016, elasticity calculations from the VHLSS 1997–98, smoking-attributable death events from the GBD 2016, and tobacco-related OOP medical expenses assumed at D 7.5 trillion.
Note: Deciles are created based on per capita household consumption.

9.C. Impact on poverty and premature deaths

Using the above results, calculations are performed to estimate the impact of increasing cigarette taxes on poverty, household impoverishment from tobacco-related medical bills, and premature deaths. Poverty rates are calculated using the international poverty line of US\$3.20 PPP per capita per day for lower-middle income countries.²⁰

²⁰ Results using the national poverty line by the General Statistics Office GSO – World Bank (D 31.6 thousand per capita, per day) yield similar patterns.

The results in Table 7 suggest that small to moderate price increases (columns a and b) may not be sufficient to affect these indicators. Nonetheless, as the price increases, the three indicators observe positive changes. Under the most positive scenario (increasing the specific excise to D 10,000 or by D 2,000 over five years) 80 to 170 thousand people could overcome poverty in Vietnam; 16 to 21 thousand people would avoid falling into poverty because of tobacco-related OOP medical expenses; and over 30,000 premature deaths could be prevented every year. Assuming that poorer households purchase lower-priced cigarettes, imposing a specific excise that burdens economy brands more heavily (as opposed to an equivalent tax increase) will result in higher net income gains for the poor and, therefore, larger poverty reductions.

Table 7. Simulations on poverty reduction, averted impoverishment, and smoking-related deaths, 2016

	POLICY SCENARIO: EXCISE INCREASE EQUIVALENT			
	D 1,000 (A)	D 3,000 (B)	D 5,000 (C)	D 10,000 (D)
a. Poverty reductions				
Homogeneous price shock				
Number of poor people	-	-	29,897	81,921
Heterogeneous (decile-specific) price shock				
Number of poor people	-	29,897	69,933	170,469
b. Averted impoverishment				
Homogeneous price shock				
Number of people	-	-	-	16,244
Heterogeneous (decile-specific) price shock				
Number of people	-		11,622	21,328
c. Averted smoking-related lives lost				
Homogeneous price shock				
Number of lives saved	3,087	9,262	15,437	30,873
Share of smoking-related deaths	4%	11%	18%	36%
Heterogeneous (decile-specific) price shock				
Number of lives saved	3,372	10,116	16,860	33,720
Share of smoking-related deaths	4%	12%	20%	40%

Source: Estimates based on data of World Development Indicators; VHLSS 2016; GSO; PovcalNet (online analysis tool), World Bank, Washington, DC, <http://iresearch.worldbank.org/PovcalNet/>.

Note: Poverty rates are calculated based on the US\$3.20 PPP (2011) international poverty line. All calculations assume that household OOP medical expenses related to smoking add up to D 7.5 trillion in 2016. All estimates assume a medium-bound elasticity scenario. The homogeneous price shocks refer to a unique change for all households of 8, 24, 40, and 80 percent of the price, respectively. The heterogeneous price shock scenarios assume different price shocks for each decile, following the assumptions of Table 6.

CONCLUSIONS AND DISCUSSION

This paper estimates the welfare and distributional effects of increasing taxes on cigarettes in Vietnam, using an ECBA methodology. It calculates decile-specific price elasticities of demand for cigarettes, providing new evidence on the responsiveness of different income groups to price policies on tobacco, specifically within the Vietnamese context. The elasticity estimations for Vietnam are consistent with previous findings from other countries both in magnitude and distribution across income groups. Lower-income groups are more sensitive to changes in the price of tobacco products and thus more likely to reduce consumption when faced with a tax increase. Poorer households—the bottom 40 percent—also face the highest prevalence rates of smoking, and they allocate much higher shares of their budgets to cigarettes.

The ECBA methodology aims for a more comprehensive understanding of the effects of increasing taxes on tobacco by incorporating the costs to household welfare through the direct price effect on their budgets as well as the indirect economic benefits derived from the reductions in smoking induced by the tax increase. The benefits considered in the ECBA were the reductions in tobacco-related medical bills and the potential increases in household earnings from preventing smoking-related premature deaths. Contrary to traditional arguments of regressive effects, the empirical findings suggest that increasing taxes on tobacco can be a progressive and welfare-improving policy measure in Vietnam. Because lower-income households exhibit higher smoking rates, as well as more sensitive behavioral responses, they reduce tobacco consumption more severely when faced with a price shock. Consequently, they can also grasp the largest relative benefits from tobacco taxation policies. Moreover, for sufficiently large price shocks and elasticities, the benefits of tobacco taxes can completely offset the increased tax liabilities, resulting in positive net income gains. Under the scenarios considered, these income gains can translate into reducing poverty by up to 170,000 people every year, to preventing up to 30,000 annual smoking-related premature deaths, and to avoiding impoverishment of up to 21,000 people because of OOP medical bills for treating tobacco-attributable diseases.

The results and the estimated parameters of the model suggest important policy implications. First, the price elasticities—or more generally, the behavioral responses of consumers—should be a key target of policy actions in Vietnam. Naturally, increasing the

health and economic benefits of tobacco taxes (and minimizing the potential for negative budget shocks on vulnerable households) requires that consumers have the willingness and support to reduce smoking. Further understanding and leveraging consumer responses toward quitting tobacco and complementing taxation with other multisectoral interventions to promote behavioral changes will be a fundamental. For example, given the overwhelming majority of male adults among smokers and social norms that may influence these behaviors among men (World Bank 2019), in addition to increasing taxes on tobacco, policy should target and support the responsiveness and available resources for these groups to quit smoking.

Second, the exploratory analysis in Vietnam shows that the affordability of tobacco products has continued to increase over time. The benefits of increasing taxes require that households find large enough price barriers to continue to purchase tobacco. In the context of increasing incomes in Vietnam, the ECBA hence suggests the need for careful consideration of price shocks sufficiently large to affect affordability and consumer behavior. For example, a modest D 1,000 (or equivalent 8 percent) price increase is unlikely to yield poverty reductions or achieve net income gains, although it would still bring other benefits, such as positive health impacts.

Third, the simulations under homogeneous and heterogeneous price shocks also suggest the potential of a specific excise to yield more progressive incidence. In contrast to an ad valorem price increase that homogeneously raise prices by the same percentage shock for all smokers, the specific excise reduces the affordability of cigarettes particularly for lower-income households (that are assumed to purchase lower-priced brands). This results in large positive benefits for lower-income households, who combine higher price elasticities and larger proportional price shocks. However, the simulations also suggest the need for sufficiently large price shocks and accurate estimations of medical expenses and years of life lost to avoid the risks of the direct price effect driving net negative income changes. Addressing the close-to-zero effect on wealthier households from raising the specific excise also constitutes a public health challenge.

Fourth, tobacco-related medical expenses are key in determining the net income effects of raising cigarette taxes in Vietnam. The base estimation incorporates only household OOP medical expenses. But simulations included in the Annex show that the overall social costs of medical treatment (or higher estimates of OOP) account for large and regressive costs of tobacco on household incomes. Vietnam is currently facing increasing fiscal pressures, while transitioning toward a rapidly aging population, a higher burden of noncommunicable diseases, and growing expectations and demand for medical attention by the growing middle class (Teo et al. 2019; World Bank 2019). The ECBA

suggests that the public finance case for tobacco taxation and investment in tobacco-control measures is stronger than ever. It also highlights the need for reliable calculations of tobacco-related medical costs in Vietnam. And it highlights the role of health insurance and social protection schemes to prevent tobacco-related catastrophic medical expenses and impoverishment, as well as to act as mechanisms for redistribution and long-term welfare gains.

Fifth, another key takeaway from this exercise is the pressing need to improve the availability of data on tobacco consumption patterns and tobacco-related medical expenses in Vietnam. Vietnam is rich in a variety of household surveys and other sources of information. However, the lack of complete and updated data on tobacco purchases (prices and quantities) prevents the calculation of more up-to-date elasticities for the country. Collecting high-quality, more granular data on the quantities and prices of tobacco consumption in subsequent waves of the VHLSS or other surveys would inform and enhance the impact of evidence-based policy making. In addition to updating the elasticity estimates, these data would allow the concern to be further explored that Vietnamese smokers may downward switch to cheaper tobacco products (Guindon et al. 2010; World Bank 2017), offsetting the smoking reduction and the health benefits derived from taxes on cigarettes.

Sixth, there are several limitations of the ECBA in assessing the overall impact of increasing cigarette taxes on the welfare of the Vietnamese population. Given empirical and methodological complexities, some relevant effects of increasing taxes are not yet incorporated to the ECBA estimation, including the effects on secondhand smoking, the productivity gains from reducing tobacco-related illnesses among workers, the change in opportunity costs to families for taking care of sick smokers, and so on. Moreover, the empirical application of the ECBA estimates income changes. However, several variables can impact people's welfare, beyond quantifiable income changes. Important effects of reducing smoking—including the intrinsic value of the human lives lost to tobacco consumption or the ability to enjoy good health—would be difficult to quantify and integrate into any ECBA. Nonetheless, such effects are likely to constitute large benefits of increasing taxes on cigarette and to increase the welfare of Vietnamese individuals and society.

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ANNEX

Annex A. Extended cost benefit analysis (ECBA) model

This Annex provides a formal description of the components of the extended cost benefit analysis (ECBA) methodology. Different ECBA models have been applied in the health literature to estimate the effects of tobacco on health and economic outcomes. This interpretation of the ECBA was adapted by Fuchs and Meneses (2017a, 2017b, 2018) with an emphasis on empirical applications to household survey data. The reader should refer to the original work by Pichón-Riviere et al. (2014) and Verguet et al. (2015) for further methodological details.

A partial equilibrium approach is taken to simulate the impact on household welfare, from an increase in the price of the tobacco product. The model evaluates the first-order effects of a change in prices, relying on the empirical estimation of price elasticities of demand (at the level of income-deciles) to simulate consumer behavioral responses. The reduction in the quantity of tobacco consumption is estimated at the decile level (as opposed to traditional estimations aggregated at the country-level), and assumed to have a direct effect on people's health outcomes.²¹

The net effect on household welfare due to the change in the price of tobacco ($\Delta W_{t,i}$) is simply calculated by adding the costs and benefits captured in components (A), (B) and (C). Further details on the calculation of each component are presented below.

$$\Delta W_{t,i} = \underset{(A)}{\Delta \omega_{t,i}} + \underset{(B)}{\Delta MedExp_{t,i}} + \underset{(C)}{\Delta YLL_{t,i}}$$

The after-tax costs and benefits faced by households result from the interaction between the price shock on tobacco, and the (magnitudes and distribution) of the price elasticities and the initial smoking patterns of the population. This interaction hence determines whether a price reform will be more regressive, more neutral, or more progressive.

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²¹ The model assumes that the health effects of tobacco-related diseases will immediately diminish with the reduction in tobacco consumption. Even though this assumption is implausible in the short term because changes in the effects of tobacco-related diseases take time to materialize, it provides an upper-bound estimate of the effects of tax increases.

Empirically, to obtain the distributional incidence, the effects are averaged over deciles, and presented relative to each decile's average income.

Consumer behavioral responses

The reduction in the quantity of tobacco consumption ($\Delta q_{t,d}$) is estimated for households in decile d , after a price increase Δp_t in tobacco.

$$\Delta q_{t,d} = \Delta p_t * \epsilon_d$$

A direct pass-through scenario—where behavioral responses are ignored, and household entirely absorb the price shock—fits into the model as the case with $\epsilon_d = 0$.

Change in tobacco expenditures (A)

The direct effect of increasing prices on the tobacco product (t) for household (i) in decile (d) is calculated as:

$$\text{Change in Tobacco Expenditures: } \Delta \omega_{t,i,d} = (1 - (1 + \Delta p_t) * (1 + \Delta p_t * \epsilon_d)) * \omega_{t,i,d}^0 \quad (a)$$

Where $\omega_{t,i,d}^0$ expresses the initial (pre-tax) budget share of tobacco expenditures in total household i consumption. For the distributional incidence analysis, $\Delta \omega_{t,i,d}$ is averaged by decile.

Change in medical expenses (B)

The change in medical expenses associated with tobacco-related diseases is estimated as:

$$\text{Change in Medical Expenses: } \Delta \text{MedExp}_{t,i} = (\Delta p_t * \epsilon_d) * \frac{\text{Cost Treatment}_{t,i}}{W_i^0} \quad (b)$$

Where $\text{Cost Treatment}_{t,i}$ are the costs of medical treatment due to tobacco-attributable diseases affecting household i , and W_i^0 is the household's total consumption. Empirically, the national estimates of treatment costs are distributed across deciles d proportionally to the share of all households that consume tobacco in the population.

Change in the years of productive life lost (C)

The model incorporates the impact of tobacco-related mortality on household welfare by accounting for the forgone earnings due to smoking-attributable premature deaths.²²

²² This approach does not attempt to account for the value of the lives lost to tobacco-related diseases. Exercises to impute an economic value to those lives face a variety of methodological caveats in the literature (see Lightwood et al. 2000 for a discus-

$$\text{Change in income from YLL: } \Delta YLL_{t,i} = (\Delta p_t * \epsilon_d) * \frac{YLL_{t,i} * I_i}{W_{i,d}^0}$$

Households can benefit from higher earnings (or rather lower forgone incomes) by cutting smoking as a reaction to the price increase. The benefit for each household arises from the tax-induced reduction in smoking $(\Delta p_t * \epsilon_d = \Delta q_{t,d})$, and the potential earnings (I_i) that would accumulate over the course of the additional years of productive life (which mirror the years of life lost [YLL] because of tobacco-attributable premature deaths, $YLL_{t,i}$).

Empirically, the model assumes that income equals total consumption for all households. And the parameters are estimated at the decile- (instead of household-) level. The $YLL_{t,i}$ are distributed across deciles d proportionally to the share of all households that consume tobacco in the population.

Annex B. Description of data sources

Vietnam Household Living Standards Survey (VHLSS) 1997–1998

The VHLSS 1997-1998 is used to calculate decile-specific price elasticities of demand for tobacco products in Vietnam. The 1992-93 and 1997-98 rounds of the survey included a series of questions on the use of tobacco products (as part of the health section, for all individuals aged 6 and over), including the quantity of cigarettes smoked per day. Additionally, the 1997-1998 round collected data on the corresponding individual expenditures on cigarettes. Subsequent rounds of the survey did not collect similar information on cigarette consumption.

Source: World Bank. 2001. Vietnam Living Standards Survey (VLSS), 1997-98. Basic Information. Poverty and Human Resources Division.

Vietnam Household Living Standards Survey (VHLSS) 2016

Data on household tobacco and total expenditures are taken from the VHLSS 2016. The survey included a sample of 9,933 households, representing 24.7 million households or 93.3 million people in the country.

Source: Vietnam Living Standards Survey (VHLSS), 2016.

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sion). The proposed ECBA takes the more modest years of life lost approach to capture the labor income flows that households lose due to tobacco illnesses. The overall impact of the lives lost on society's welfare and wellbeing would be much higher and difficult to calculate.

Global Adult Tobacco Survey (GATS)

The Global Adult Tobacco Survey (GATS) is a globally standardized household that monitors adult tobacco use and tobacco control indicators. It collects nationally representative data of male and female adults (15 years or older). In Vietnam, the GATS has been collected in 2010 and 2015. The 2015 round used a sample of 9,514 households and interviewed 8,996 individuals. The questionnaires included variables on household and individual sociodemographic characteristics (including household assets), tobacco consumption and expenditure patterns (for tobacco smoking, smokeless tobacco, cessation and secondhand smoke), exposure to media, and knowledge and attitudes. Data on household incomes or total consumption are not collected.

Source: GATS (Global Adult Tobacco Survey). 2017. "Global Adult Tobacco Survey Viet Nam, 2015. Codebook."

Annex C. Estimation of price elasticities of tobacco

Econometric model

Let Q_{id} be defined as the average quantity of cigarettes smoked per day by individual i in income decile d ; P the average price per cigarette (unit value of tobacco use); D_i the consumption decile of individual i ; and X_{id} the individual characteristics. Then, the smoking intensity equation is written as follows:

$$\ln Q_{id} = \beta_0 + \beta_1 \ln P * D_i + \beta_3 X_{id} + \mu_{id}$$

The empirical analysis of the equation assumes a log-log relationship among smoking intensity, price, and income. $\ln Q_{id}$ is observed if and only if the individual in a given decile d is a current smoker.

Regression results from the empirical application based on the VHLSS 1997–98 are available from the authors upon request.

Annex D. Robustness checks

Figure A.1. Net income effect, considering public and private medical expenses

Figure A.1. Net income effect, considering public and private medical expenses, Cont.

Source: Estimates based on household expenditure data from the VHLSS 2016, elasticity calculations from the VHLSS 1997–98, smoking-attributable death events from the GBD 2016, and tobacco-related medical expenses adapted from Hoang et al. 2016.

Note: Deciles are created based on per capita household consumption. Estimates consider public and private medical expenses, assumed to add up to D 17.5 trillion in Vietnam (2016).

Figure A.2. Net income effect, considering mid-bound medical expenses

A. Price increase of 8% across all deciles

B. Price increase of 24% across all deciles

C. Price increase of 40% across all deciles

D. Price increase of 80% across all deciles

Figure A.2. Net income effect, considering mid-bound medical expenses, Cont.

Source: Estimates based on household expenditure data from the VHLSS 2016, elasticity calculations from the VHLSS 1997–98, smoking-attributable death events from the GBD 2016, and tobacco-related medical expenses adapted from Goodchild et al. 2018.

Note: Deciles are created based on per capita household consumption. Medical expenses are assumed to add up to D 11.3 trillion in Vietnam (2016).