HHS Public Access

Author manuscript

Margin J Appl Econ Res. Author manuscript; available in PMC 2017 August 23.

Published in final edited form as:

Margin J Appl Econ Res. 2016 ; 10(1): 55–85.

Tobacco-free economy: A SAM-based multiplier model to quantify the impact of changes in tobacco demand in Bangladesh

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Abstract

In Bangladesh, where tobacco use is pervasive, reducing tobacco use is economically beneficial. This paper uses the latest Bangladesh social accounting matrix (SAM) multiplier model to quantify the economy-wide impact of demand-driven changes in tobacco cultivation, bidi industries, and cigarette industries. First, we compute various income multiplier values (i.e. backward linkages) for all production activities in the economy to quantify the impact of changes in demand for the corresponding products on gross output for 86 activities, demand for 86 commodities, returns to four factors of production, and income for eight household groups. Next, we rank tobacco production activities by income multiplier values relative to other sectors. Finally, we present three hypothetical 'tobacco-free economy' scenarios by diverting demand from tobacco products into other sectors of the economy and quantifying the economy-wide impact. The simulation exercises with three different tobacco-free scenarios show that, compared to the baseline values, total sectoral output increases by 0.92%, 1.3%, and 0.75%. The corresponding increases in the total factor returns (i.e. GDP) are 1.57%, 1.75%, and 1.75%. Similarly, total household income increases by 1.40%, 1.58%, and 1.55%.

Keywords

Social accounting matrix; Bangladesh SAM; Tobacco consumption; Tobacco-free economy; Multiplier model; Multiplier values; Input-output tables; Demand-driven interventions

Introduction

The tobacco epidemic in Bangladesh is pervasive. The Global Adult Tobacco Survey (GATS) estimates that 43.3 per cent of adults in Bangladesh (41.3 million persons) use tobacco in smoke and/or smokeless form (World Health Organization, 2009). As the global call for the tobacco 'end game' strategy is gaining momentum (Warner, 2013), it is relevant to quantitatively assess the significance of tobacco products and their place in the economy. This paper offers a better understanding of the way tobacco-related production activities

interact with various agents (i.e. other production activities, factors of production, and socio-economic groups) in the Bangladesh economy.

Public health efforts to reduce tobacco consumption have strengthened over the last half century, often involving wide-ranging policy initiatives such as smoke-free policies, mass media campaigns, restriction on youth access to tobacco products, price increases driven by fiscal measures, tobacco smuggling deterrence, and cessation assistance programmes. The WHO Framework Convention on Tobacco Control (WHO FCTC) is the first global health treaty providing the foundation for countries to implement and manage tobacco control (World Health Organization, 2003). Also, for effective implementation of some specific WHO FCTC provisions, WHO introduced the MPOWER measures in 2008, particularly to assist in reducing the demand for tobacco products at the country level (World Health Organization, 2008). In response to increasing tobacco control outreach, the tobacco industry frequently highlights the employment and income implications of reduced tobacco consumption, asserting that tobacco farming and the manufacturing, distribution, and sale of tobacco products constitute a vital part of the economy. However, if tobacco use is reduced, resources previously spent on tobacco would not disappear from the economy, but could be put to alternative uses, and the redistribution of resources from tobacco consumption to other goods and services could create jobs and generate income in other sectors of the economy.

Several independent studies have estimated the net impact on economic activity resulting from eliminating or reducing expenditure on tobacco, using assumptions about how the alternative expenditure would be redistributed in the economy (Jacobs et al., 2000). The results generally suggest that economic losses in the tobacco and associated sectors are outweighed by increases in employment in other industries, generated from the shifting of expenditure from tobacco to other sectors. For instance, a study on Scotland by McNicoll and Boyle (1992) assumed the elimination of domestic tobacco consumption expenditures and redistribution of the amount to other sectors according to average expenditure patterns. Similarly, van der Merwe (1998a, 1998b), Buck et al. (1995) and Irvine and Sims (1997) assumed full elimination, a 40 per cent decline, and a 20 per cent decline in domestic tobacco consumption expenditures, respectively. All studies projected net economic gains. However, a study on Zimbabwe by van der Merwe (1998c) reported net losses under the scenario of elimination of domestic consumption expenditures and all tobacco production in 1980, and redistribution according to ‘average’ input-output patterns, with all production shifted to alternatives in agriculture. In terms of the assumptions regarding the redistribution of the marginal increase in smokers’ income, other scenarios are also suggested in the literature, e.g., increase of expenditure on recreational goods and services rather than on essential items (Buck et al., 1995).

In this study, we use the latest Bangladesh social accounting matrix (SAM) for the year 2006/07 constructed incorporating 86 sectors and 86 commodities, four factors of production, and eight household groups, and a SAM-based multiplier model, to track how demand-driven reductions of the products of tobacco cultivation, bidi industries, and cigarette industries may affect the economy. First, we compute various income multiplier values (i.e. backward linkages) for all the production activities in the economy to quantify the impact of changes in demand for the corresponding products on gross output for 86

activities, demand for 86 commodities, returns to four factors of production, and income for eight household groups. Next, we rank tobacco production activities by income multiplier values relative to other sectors. Finally, we present three hypothetical 'tobacco-free economy' scenarios by diverting exogenous demand amounts from tobacco-related products into other sectors of the economy proportionately, and quantifying its impact on sector-wise output, on the consumption of different commodities, on income generation for the various factors of production, and on the income of different socio-economic groups. The simulation scenarios entail elimination of tobacco consumption (i.e. products originating directly from tobacco cultivation, bidis and cigarettes) in monetary terms, and redistribution of the same monetary amount to (a) all other commodity items, (b) food items only, and (c) recreational or entertainment items only, according to the average consumption pattern.

Methods

Bangladesh Social Accounting Matrix 2006/07

SAM is a data system in the form of a square matrix, which records the monetary transactions taking place in an economy during a specific period of time, generally one year. As a data framework, it may be described as a natural extension of the input-output (IO) accounting systems that bring together not only disaggregated data on the inputs and outputs of the productive branches in the economy, but also data concerning the distribution of the various kinds of factor incomes across institutional groups, the redistribution of income among these groups, the expenditure made by these groups on different types of commodities, and savings and investments made by them. The data blocks in the SAM follow, in disaggregated terms, the main consecutive stages which can be distinguished in the circular flow that characterises the full economic process (Alarcon et al., 1991, p. 2; Pyatt and Round, 1979).

A centerpiece of Bangladesh's Sixth Five-Year Plan (SFYP, 2011–15) was the delineation of the country's macroeconomic outlook, and the SAM 2006/07 provides an important data framework for economic model construction (Khondker and Selim, 2011; GoB Planning Commission, 2011). Construction of the 2006/07 SAM is based on several data sets drawn from diverse sources, including the input-output table 2007 for Bangladesh prepared as a background document for the technical framework for the Sixth Five-Year Plan, the social accounting matrix for Bangladesh for 2000 by Bangladesh Planning Commission, Bangladesh Bureau of Statistics, Household Income and Expenditure Survey (HIES) 2005, Economic Survey of Bangladesh 2008 by the Ministry of Finance, Export Promotion Bureau and Bangladesh Bank (i.e. the central bank of Bangladesh), and the National Board of Revenue (GoB Planning Commission, 2011).[1]

The Bangladesh SAM 2006/07 identifies the economic relations through four types of accounts: (i) production activity and commodity accounts for 86 sectors; (ii) four factors of productions with two types of labour and two types of capital; (iii) current account

[1]The concept of SAM is not new in Bangladesh. The 'Sustainable Human Development (SHD)' project of the Planning Commission of Bangladesh constructed a SAM for 1993 based on the input-output (IO) table of 1993 (SHDU, 2000). As part of their in-house exercise, the project also constructed a SAM for the year 2000 known as SHD-SAM 2000 (SHDU, 2002) using the input-output table 2000 (SHDU, 2003).

transactions between four main institutional agents; household-members and unincorporated capital, corporation, government and the rest of the world; and (iv) two consolidated capital accounts distinguished by public and private origins to capture the flows of savings and investment. The disaggregation of activities, commodities, factors and institutions in SAM 2006/07 is given in Appendix Table 1. There are three tobacco-related production activities (and correspondingly three commodities) in the SAM: (i) tobacco cultivation, which entails tobacco farming activities and the final product directly originating from that sector; (ii) the *bidi* industry (bidis and bidi-related manufactured tobacco products); and the (iii) cigarette industry (manufactured cigarettes).

Table 1 presents the Bangladesh SAM in its aggregate form. The SAM follows the fundamental accounting principle that for every income or receipt there is a corresponding expenditure or outlay, which underlies the double-entry accounting procedures embedded in the macroeconomic accounts of any country. However, instead of the double-entry conventions of national accounts used to depict the correspondence between income and expenditure, SAM uses single-entry accounting to show the income and expenditure correspondence. Thus, SAMs embody this principle, but record the transactions between accounts in a square matrix (Alarcon et al., 1991; Pyatt and Round, 1979). The transactions or accounts constitute the dimension of the square matrix. Table 1 shows that the SAM 2006/07 ensures equality between supply and demand of production activities and commodities; between factor receipts and outlays; between income and expenditures of institutions; and the savings and investment identity. This consistency is maintained not only at the macro level, but also for each of the meso-level disaggregated accounts of the SAM.

The Tobacco Economy in the SAM 2006/07

According to the Bangladesh SAM, total household consumption on tobacco products amounts to 90,743 million BDT, of which 71,724 million BDT is spent on cigarette consumption, 17,931 million BDT on bidi, and 1,088 million BDT on other tobacco farming products (mainly smokeless and non-manufacturing tobacco products). Households spend about 2.54 per cent of their total consumption expenditure on tobacco products.[2] The share of tobacco consumption to total GDP is 1.99 per cent (i.e. 1.57% on cigarettes, 0.393% on bidis, and 0.024% on other tobacco products). Rural and urban households contribute 65 per cent and 35 per cent of the cigarette expenditure, respectively. The contributions of rural and urban households in bidi consumption are 91 per cent and 9 per cent, respectively. Figure 1 reveals the tobacco consumption pattern in monetary terms by different household groups. Expenditure on cigarettes constitutes the bulk of total tobacco expenditure. Expenditure on bidis is higher in rural household groups than urban households and poorer households than their richer counterparts. Rural landless, small farmers, and non-farm household groups spends about 30 per cent of their total tobacco expenditure on bidi products. Urban high-educated households mainly consume cigarettes.

[2]An economic study by Efroymson et al. (2001) on the opportunity costs of tobacco expenditure in Bangladesh demonstrates that households divert a significant amount of scarce income to tobacco products, and tobacco expenditure potentially crowds out expenditure on basic needs, such as food, health, and/or education. In effect, tobacco expenditures exacerbate the effects of poverty and cause significant deterioration in living standards among the poor.

SAM Multiplier Model

Since a SAM inherits the feature of a modular analytical framework, it has frequently been used to examine the consequences of real shocks, using a multiplier model that treats the circular flow of income endogenously. More specifically, the SAM framework, under certain assumptions, can be used to estimate the effects of exogenous changes and injections, such as increases or decreases in the demand for specific products on the whole socioeconomic system (Pyatt and Round, 1979; Robinson, 2006; Round, 2003; Thorbecke, 2000; and Defourney and Thorbecke, 1984). The move from the SAM structure to a model structure requires that the accounts of this matrix be segregated into endogenous and exogenous. The need for this arises from the fact that there must be an entry in the system, i.e. some variables must be manipulated exogenously via injections (such as a change in demand) in order to evaluate the consequences on the endogenous accounts.

As a general guideline, accounts *a priori* specified as objectives or targets when the SAM was built should be made endogenous. On the other hand, accounts intended to be used as policy instruments, or those that are not endogenously determined from direct interactions among domestic economic agents and institutions, should be made exogenous (Alarcon, 2000; Round, 2003). Following these criteria, the production account (sectors and commodities), the factors account, and the households account are selected as endogenous accounts. This helps to focus on the interaction between two sets of agents (production activities and households) interacting through two sets of markets (factors and commodities). Government, corporations, the rest of the world (i.e. foreign countries), and the capital accounts are made exogenous, because government outlays are usually policy-determined, the external sector is outside domestic control, and investment is exogenously determined in the model (Alarcon, 2000; Round, 2003).

The impact of any given injection into the exogenous accounts of the SAM is transmitted through the interdependent SAM system among the endogenous accounts. The interwoven nature of the system implies that incomes of factors, households and the production sectors are all derived from exogenous injections into the economy via a multiplier process. Accounting multipliers are calculated according to the standard Leontief inverse formula:

$$Y = A * Y + X = (I - A)^{-1} * X = M_a * X \quad (1)$$

Here: $\boldsymbol{Y}$ is a vector of endogenous variables (accounts); $\boldsymbol{X}$ is a vector of exogenous variables (accounts); $\boldsymbol{A}$ is the matrix of average propensities of expenditures for endogenous accounts; $\boldsymbol{I}$ is the identity matrix; and $\boldsymbol{M_a}$ or $(\boldsymbol{I} - \boldsymbol{A})^{-1}$ is the matrix of aggregate accounting multipliers.

The multiplier process is developed here on the assumption that when an endogenous account receives an exogenous injection, it spends it exactly in the same proportions as shown in the matrix of average propensities to spend (APS). The elements of the APS matrix is calculated by dividing each cell by its corresponding column sum totals. The dimension of the $\boldsymbol{M_a}$ matrix is *184x184* with broadly categorised four endogenous accounts (i.e. 86 sectors

and 86 commodities, four factors, and eight households). The dimensions of both the Y (endogenous) and X (exogenous) vectors are *184x1*.

The interpretation of the values in $\boldsymbol{M_a}$ is straightforward. When read column-wise, the values show the increase of income in each of the 184 endogenous elements due to one unit of external injection into the column element via the exogenous accounts. The term 'injection' refers to the income increase via exogenous accounts due to the increased demand for sectoral outputs, or investment demand, or exogenous income transfers to households; and is expressed in monetary units. The sum of all the values in a particular column would then show the total backward linkage that is generated due the one unit injection in the corresponding column account. Modular partial backward linkages can be identified for each of the broad endogenous accounts in the SAM, i.e. activities, commodities, factors, and households. Table 2, in which the $\boldsymbol{M_a}$ matrix is partitioned and presented as a collection of sub-matrices, illustrates this further.

When demand-driven interventions occur through the commodity accounts (i.e. an exogenous increase or decrease in demand), the relevant blocks for the impact-analysis refer to M_{12} (gross output impact for 86 sectors), M_{22} (commodity demand impact for 86 commodities), M_{32} (GDP impact for four factors of production), and M_{42} (household income impact for eight household groups). Since the present multiplier framework has four endogenous accounts, four types of multiplier measures can be calculated: the output multiplier, demand multiplier, GDP multiplier, and household income multiplier.

Shocks occurring in a particular production account (e.g. commodity demand) will impart their impact predominantly to the account's linkage industries. The inter-industry transactions in the SAM 2006/07 reveal that tobacco cultivation mainly has backward linkages with the fertiliser industry, wholesale and retail trade, water and land transportation, banks, insurance and real estate, and other services. The bidi and cigarette industries have their main linkages with tobacco cultivation, the paper industry, basic chemicals, wholesale and retail trade, water and land transport, bank insurance and other services, and rural and urban building infrastructure. All these sectors are also linked with other sectors of the economy. The ultimate economic impact of the exogenous reduction in tobacco consumption and the concomitant increase in demand for other commodities from the redistribution in our simulation scenarios is the net benefit, which depends on the values of the multipliers.

While the multipliers obtained using the SAM as a linear model allow us to capture the structural features of income distribution and interrelations among various economic agents, the model rests on some assumptions. It assumes the existence of excess capacity that would allow relative prices to remain constant in the face of demand shocks; that expenditure propensities of endogenous accounts remain constant; and that production technology and resource endowments are given for a period. Therefore, the SAM-based multiplier model inherits the assumptions of the traditional input-output analysis, particularly the following (Alarcon, 2000, p. 16): (a) average propensities to spend are fixed, linear, and considered constant or at least stable over the short-to-medium term; (b) relative prices are constant over the time horizon of the model, usually the short-term, implying that the components which make up any account bunch have substitution elasticities which are zero across accounts and

infinite within accounts, i.e. they are homogenous within and heterogeneous across accounts; (c) expenditure-income elasticities are constant and equal to unity; (d) there is perfect complementarity between capital and other factor inputs; (e) it offers a nominal analysis in current prices; (f) the economy has idle capacity utilisation; and (g) a number of accounts are exogenous.

The richness of the SAM multipliers comes from their tracing out chains of linkages from changes in demand to changes in production, factor incomes, household incomes, and final demands (Thorbecke, 2000 pp. 21–22). Therefore, the SAM framework permits tracing and quantifying all the propagation channels in the economy; and in doing so, provides a very useful policy instrument for meso-level economy-wide impact analysis of demand-driven interventions.

Simulation Design

We assumed three scenarios within a hypothesised tobacco-free economy context, based on the premise that when resources are no longer devoted to a given economic activity, they do not simply disappear; rather, they are redirected to other economic activities (Warner, 2000). If people stop tobacco consumption, for instance, the money that would have been spent on tobacco products could now be spent on something else. The new spending could stimulate demand in other production activities. We designed the following three simulation scenarios to evaluate and compare the economy-wide impact of changes in demand for tobacco-related commodities.

1. A reduction of exogenous tobacco demand by 90,743 million BDT, equaling the total household consumption demand amount spent on products directly originating from tobacco cultivation (mainly smokeless non-manufactured items), bidi industries, and cigarette industries; and redistributing the total 90,743 million BDT among all other commodity demands according to weighted household consumption shares.
2. A reduction of exogenous tobacco demand by 90,743 million BDT as above and redistributing that demand to only food items (i.e. sugarcane, potatoes, vegetables, pulses, oilseeds, fruit, cotton, tea, spices, other crops, livestock, poultry, shrimp, fishing, forestry, rice milling products, grain milling products, processed fish, oil, sweetener products, tea, refined salt, and processed food) according to the weighted household consumption shares of these items.
3. A reduction of exogenous tobacco demand by 90,743 million BDT and redistributing that amount to the commodity category “entertainment” only.

Results

Ranking of tobacco commodities in terms of their backward linkages

The M_{12}, M_{22}, M_{32}, and M_{42} sub-matrices of the $\boldsymbol{M_a}$ multiplier matrix show column-wise the increase in gross outputs in the sectors, demand for the commodities, incomes of the factors of production, and incomes of the household groups, respectively, that results from one unit of injection into any particular column account. Therefore, row-sums of the

respective sub-matrices show the total increase in output (i.e. the gross output multiplier), commodity demand (i.e. demand multiplier), GDP (i.e. the GDP multiplier), and household income (i.e. income multiplier).

The values in Table 3 indicate how a one unit increase in the demand for each of the commodities leads to a total increase in the income of four endogenous accounts as a whole. For instance, considering the gross output multipliers in Panel 1 on the left, a one unit injection in 'fish process' leads to 5.08 units of output increase in the economy, compared to the 2.45 unit increase when the injection occurs in the cigarette industry. The top five sectors in terms of generating the highest gross output multipliers are fish process, shrimp farming, rice milling, hotels and restaurant, and poultry rearing, which indicates their high integration with other sectors. The bottom five sectors that generate the least gross output multiplier values are fertilisers, petroleum, yarn, basic chemicals, and cotton, indicating their lower level of integration with other sectors and high leakages attributable to imports from the rest of the world.

Bidis, tobacco cultivation, and cigarettes are ranked 36th, 67th, and 68th among the 86 commodities in the SAM. Similarly, the demand multipliers in panel 2 on the right of Table 3 report that bidis, tobacco cultivation, and cigarettes are ranked 39th, 67th, and 70th, respectively. A one unit increase in the exogenous demand for cigarettes will create only 2.68 units overall demand in the economy compared to, for example, 5.46 units when demand increases for processed fish.

GDP Multipliers

The GDP multipliers in Table 4 show that the sectors that produce high (low) gross output and demand multipliers do not automatically generate high (low) GDP multipliers accordingly. Table 4 reports the ranking of the commodities in terms of total GDP multipliers and also for each of the factors of production, separately. Tea cultivation produces the highest GDP multiplier value, i.e. a one unit increase in exogenous demand leads to 2.26 units increase in total factor returns. Bidis, tobacco cultivation, and cigarettess are ranked 52th, 61th, and 72nd among the 86 commodities, respectively. A unit injection into bidis generates 1.59 unit of GDP, of which 0.39, 0.41, 0.70, and 0.09 units are accrued to unskilled labour, skilled labour, capital returns (profits) and returns on land use, respectively. A one unit increase in cigarettes produces only 0.83 unit of GDP. While increases in the demand for bidis and cigarettes generate relatively higher rewards for labour and capital factors, tobacco cultivation generates higher value for returns to land.

Household Income Multipliers

The multiplier values in Table 5 obtained from the income multipliers in the M_{42} sub-matrix show the increase in incomes of respective household groups due to a one unit increase in the corresponding exogenous demand for the commodity. For example, when read row-wise, a one unit increase in the exogenous demand for bidi products increases a landless household's income, as a group, by 0.1 units, the marginal farmer group's income by 0.09 units, and so on, resulting in a total increase in household income by 1.49 units.[3] However, when read column-wise, the values show how a particular household group's income

increases due to a one unit injection in different sectors. For example, a one unit injection in tea cultivation would increase the landless group's income by 0.11 units, whereas they accrue only 0.05 units when the injection occurs in the form of increased cigarette demand. The column-wise ranking of values in descending order for each of the household groups would then reveal the ranking of the sectors for corresponding households in terms of income generation, and therefore, poverty alleviation. Bidis, tobacco cultivation, and cigarettes are ranked 51st, 61st, and 72nd, respectively, among the 86 commodities in the Bangladesh SAM 2006/07.

Tobacco-Free Economy: Simulation Outcomes

We present three 'tobacco-free' simulation scenarios of reduced tobacco consumption equaling the household tobacco consumption amount (90,743 million BDT) and concomitant increases in exogenous demands for other commodities under three different set-ups: (a) Scenario 1: an increase in the exogenous demand for all other commodities according to weighted household expenditure shares; (b) Scenario 2: an increase in the exogenous demand for 'food' commodities according to weighted household expenditure shares; and (c) Scenario 3: an increase in the exogenous demand for 'entertainment' only.

The four panels in Table 6 show the simulation outcomes in terms of total sectoral output, commodity demand, returns to factor, and household income under the three scenarios and compare them with the baseline scenario that reproduces the original SAM data in the absence of any change in exogenous demand. Compared to the baseline values, total sectoral outputs increased by 86,200, 121,860, and 70,010 million BDT under scenarios 1, 2, and 3, respectively, resulting in 0.92 per cent, 1.30 per cent, and 0.75 per cent increases from the baseline values. The corresponding increases in total factor returns (i.e. GDP) are 1.57 per cent, 1.75 per cent, and 1.75 per cent, respectively. Similarly, total household income would increase by 66,030, 74,730, and 73,390 million BDT, respectively, resulting in increases of 1.4 per cent, 1.58 per cent, and 1.55 per cent, respectively.

Appendix Table 2 reports the simulation impacts on each of the 86 sectoral outputs. The drastic elimination of tobacco demand led to obvious net reductions in sectoral outputs for tobacco cultivation, bidis and cigarettes. We observe a net negative impact on a few other sectors, e.g. paper, basic chemicals, wholesale trade, retail trade, and water transport under scenario 1; paper, basic chemicals, and the communication sector under scenario 2; and paper, basic chemicals, wholesale trade, retail trade, water transport, land transport, and railway transport under scenario 3. However, we observe a net positive impact on the majority of the 86 production activities, and the impact magnitudes are much higher leading to an overall positive economic impact. Appendix Table 3 shows similar patterns, i.e. the commodity demand in most sectors went up, leading to an overall net positive impact. Appendix Table 4 reports the impacts in terms of returns to each of the four factors of productions, and incomes for the eight household groups. A net positive impact is observed throughout.

[3]The values in each cell represent the absolute increase in income earned as a group. Across households, differential income increments are explained mainly by the size of the labour force supplied by the respective households, their integration patterns with the sectors, and existing wage differentials.

Conclusion

This paper highlights the fact that reduced tobacco use does not lead to a loss in the economy, since money no longer spent on tobacco would be used to purchase other goods and services. This reallocation of spending creates demand stimuli in other sectors of the economy and generates larger multiplier effects and, in the process, the aggregate benefit to the economy outweighs the loss in tobacco-related sectors. This paper does not take into account the negative health consequences and several associated types of societal costs of tobacco consumption, and merely presents an economic analysis, by looking at the ways different agents in the economy interact in monetary terms. The use of the SAM offers a framework of analysis that brings together the growth and redistributive elements in a single framework, and facilitates the conducting of simulation exercises to trace and quantify each stage of various demand shocks (stimuli), in the case of tobacco-related scenarios. The results show that tobacco farm products and bidis are ranked in the bottom third quartile, and cigarettes in the bottom quartile in terms of income generation for various agents in the economy. The findings of this paper support the core demand and supply reduction provisions in the WHO FCTC, particularly the full-scale implementation of WHO MPOWER measures to reduce the demand for tobacco. In Bangladesh, where a tobacco epidemic is pervasive, striving for the tobacco end-game strategy is economically beneficial.

Acknowledgments

The authors are thankful to Samira Asma, Deliana Kostova, Xin Xu, Krishna Palipudi, Rebecca Bunnell, and Jing Xu (at the Centers for Disease Control and Prevention, Atlanta, USA); and Rubana Mahjabeen (University of Wisconsin-Superior, USA) for their comments and suggestions. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Appendix Table 1: Disaggregation and Description of Bangladesh SAM Accounts

Set	Description of Elements
Activities (86)	
Agriculture (20)	Paddy Cultivation, Wheat Cultivation, Other Grain Cultivation, Jute Cultivation, Sugarcane Cultivation, Potato Cultivation, Vegetable Cultivation, Pulses Cultivation, Oilseed Cultivation, Fruit Cultivation, Cotton Cultivation, **Tobacco Cultivation**, Tea Cultivation, Spice Cultivation, Other Crop Cultivation, Livestock Rearing, Poultry Rearing, Shrimp Farming, Fishing, Forestry
Manufacturing (39)	Rice Milling, Grain Milling, Fish Process, Oil Industry, Sweetener Industry, Tea Product, Salt Refining, Food Process, Tanning and Finishing, Leather Industry, Baling, Jute Fabrication, Yarn Industry, Cloth Milling, Handloom Cloth, Dyeing and Bleaching, RMG, Knitting, Toiletries M, **Cigarette Industry, Bidi Industry,** Saw and Plane, Furniture Industry, Paper Industry, Printing and Publishing, Pharmaceuticals M, Fertiliser Industry, Basic Chemical, Petroleum R, Earth ware Industry, Chemical Industry, Glass Industry, Clay Industry, Cement M, Basic Metal M, Metal M, Machinery and Equipment, Transport Equipment, Miscellaneous Industry
Construction (6)	Urban Building, Rural Building, Power Plant Building, Rural Road Building, Port Road Railway Building, Canal Dyke Other Buildings
Services (21)	Electricity and Water Generation, Gas Extraction and Distribution, Mining and Quarrying, Wholesale Trade, Retail Trade, Air Transport, Water Transport, Land Transport, Railway Transport, Other Transport, Housing Service, Health Service, Education Service, Public Administration and Defense, Bank Insurance and Real estate, Professional Service, Hotel and Restaurant, Entertainment, Communication, Other Services, Information Technology and ECom

Set	Description of Elements
Commodities (86)	
Agriculture (20)	Paddy Cultivation, Wheat Cultivation, Other Grain Cultivation, Jute Cultivation, Sugarcane Cultivation, Potato Cultivation, Vegetable Cultivation, Pulses Cultivation, Oilseed Cultivation, Fruit Cultivation, Cotton Cultivation, **Tobacco Cultivation**, Tea Cultivation, Spice Cultivation, Other Crop Cultivation, Livestock Rearing, Poultry Rearing, Shrimp Farming, Fishing, Forestry
Manufacturing (39)	Rice Milling, Grain Milling, Fish Process, Oil Industry, Sweetener Industry, Tea Product, Salt Refining, Food Process, Tanning and Finishing, Leather Industry, Baling, Jute Fabrication, Yarn Industry, Cloth Milling, Handloom Cloth, Dyeing and Bleaching, RMG, Knitting, Toiletries M, **Cigarette Industry, Bidi Industry**, Saw and Plane, Furniture Industry, Paper Industry, Printing and Publishing, Pharmaceuticals M, Fertiliser Industry, Basic Chemical, Petroleum R, Earth ware Industry, Chemical Industry, Glass Industry, Clay Industry, Cement M, Basic Metal M, Metal M, Machinery and Equipments, Transport Equipments, Miscellaneous Industry
Construction (6)	Urban Building, Rural Building, Power Plant Building, Rural Road Building, Port Road Railway Building, Canal Dyke Other Buildings
Services (21)	Electricity and Water Generation, Gas Extraction and Distribution, Mining and Quarrying, Wholesale Trade, Retail Trade, Air Transport, Water Transport, Land Transport, Railway Transport, Other Transport, Housing Service, Health Service, Education Service, Public Administration and Defense, Bank Insurance and Real estate, Professional Service, Hotel and Restaurant, Entertainment, Communication, Other Services, Information Technology and E-Communication
Factors of Production (4)	
Labour (2)	Labour Unskilled, and Labour Skilled
Capital (2)	Capital and Land
Current Institutions (11)	
Households (8)	**Rural:** landless, Agricultural marginal, Agricultural small, Agricultural large, Non-farm poor and Non-farm non poor
	Urban: Households with low educated heads, and households with high educated heads
Others (3)	Government, Corporation and Rest of the World

Appendix Table 2: Simulation Outcome in terms of Outputs for 86 Sectors

Impact on Sectors	Baseline	Scenario 1		Scenario 2		Scenario 3	
	Value	Value	% Increase	Value	% Increase	Value	% Increase
Paddy Cultivation	576443	599316	3.97	612664	6.28	584892	1.47
Wheat Cultivation	16283	16921	3.92	17294.2	6.21	16529.6	1.51
Other Grain Cultivation	21482	22276	3.70	22361.5	4.09	21795.3	1.46
Jute Cultivation	28012	28071	0.21	28067.2	0.19	28036.2	0.08
Sugarcane Cultivation	18204	18920	3.93	19327.2	6.17	18472.6	1.47
Potato Cultivation	59851	62251	4.01	63641.7	6.33	60742	1.49
Vegetable Cultivation	70242	72961	3.87	74560.9	6.15	71267.4	1.46
Pulses Cultivation	57033	59429	4.20	60839.2	6.67	57942.9	1.59
Oilseed Cultivation	19850	20580	3.68	20931.6	5.45	20127.8	1.40
Fruit Cultivation	47647	49653	4.21	50820.9	6.66	48421.4	1.63
Cotton Cultivation	1807	1817	0.55	1811.41	0.23	1811.12	0.21
Tobacco Cultivation	**2475**	**859**	**−65.30**	**897**	**−63.78**	**860**	**−65.24**

Impact on Sectors	Baseline	Scenario 1		Scenario 2		Scenario 3	
	Value	Value	% Increase	Value	% Increase	Value	% Increase
Tea Cultivation	6459	6677	3.37	6746.2	4.43	6546.41	1.34
Spice Cultivation	18320	19020	3.82	19223.6	4.93	18588.4	1.46
Other Crop Cultivation	29588	30677	3.68	31185.7	5.40	29998.3	1.38
Livestock Rearing	178661	185634	3.90	189563	6.10	181304	1.48
Poultry Rearing	128409	133162	3.70	133672	4.10	130284	1.46
Shrimp Farming	121612	123587	1.62	124395	2.29	122366	0.62
Fishing	335528	348762	3.94	356520	6.26	340580	1.51
Forestry	210295	214108	1.81	216225	2.82	211802	0.72
Rice Milling	709737	738224	4.01	754870	6.36	720249	1.48
Grain Milling	103630	107759	3.98	110201	6.34	105222	1.54
Fish Process	15089	15430	2.26	15632	3.59	15217.1	0.84
Oil Industry	68308	70895	3.79	72268.6	5.80	69286.8	1.43
Sweetener Industry	25870	26902	3.99	27470.2	6.18	26266.3	1.53
Tea Product	6102	6335	3.82	6422.98	5.25	6195.75	1.53
Salt Refining	5245	5440	3.72	5397.73	2.90	5321.56	1.45
Food Process	222794	231689	3.99	236836	6.30	226218	1.54
Tanning and Finishing	23394	23795	1.71	23550.5	0.67	23548.1	0.66
Leather Industry	41285	42016	1.77	41569.5	0.69	41565.2	0.68
Baling	461.68	461.89	0.04	461.799	0.02	461.775	0.02
Jute Fabrication	26592	26596	0.01	26596	0.01	26594.6	0.01
Yarn Industry	8043	8159	1.44	8095.3	0.64	8087.44	0.54
Cloth Milling	105987	106952	0.91	106418	0.41	106422	0.41
Handloom Cloth	133159	138482	4.00	135278	1.59	135136	1.48
Dyeing and Bleaching	24517	25491	3.97	24905.1	1.58	24879	1.47
RMG	358967	360296	0.37	359492	0.15	359465	0.14
Knitting	351150	352585	0.41	351716	0.16	351688	0.15
Toiletries	3583	3670	2.43	3619.12	0.99	3613.44	0.83
Cigarette Industry	**71926**	**1205**	**−98.32**	**1336.67**	**−98.14**	**1302.01**	**−98.19**
Bidi Industry	**17977**	**304.61**	**−98.31**	**337.769**	**−98.12**	**307.781**	**−98.29**
Saw and Plane	10315	10591	2.67	10503	1.81	10448.2	1.28
Furniture Industry	24592	25547	3.88	24963.3	1.51	25021.2	1.74
Paper Industry	8452	7475	−11.55	7419.21	−12.22	8406.99	−0.54
Printing and Publishing	1413	1445	2.26	1431.13	1.27	1469.86	4.01
Pharmaceuticals	64897	67334	3.75	65982.3	1.67	65847.6	1.46
Fertiliser Industry	6505	6690	2.84	6797.59	4.49	6566.54	0.94
Basic Chemical	1670	1658	−0.74	1654.83	−0.94	1640.37	−1.81
Petroleum	45848	46808	2.09	46416.5	1.24	46887.2	2.26
Earth ware Industry	13696	14150	3.32	13877.5	1.32	13875.6	1.31
Chemical Industry	19393	19984	3.05	19625.6	1.20	19617.2	1.16
Glass Industry	7708	7961	3.29	7809.11	1.31	7804.07	1.24
Clay Industry	14189	14194	0.04	14191.6	0.01	14203.2	0.10

Impact on Sectors	Baseline	Scenario 1		Scenario 2		Scenario 3	
	Value	Value	% Increase	Value	% Increase	Value	% Increase
Cement	74892	74901	0.01	74896.5	0.00	74956.9	0.09
Basic Metal	128470	128696	0.18	128641	0.13	128686	0.17
Metal	69515	70186	0.97	70137.4	0.89	70225.8	1.02
Machinery and Equip.	79682	79954	0.34	79950.1	0.34	79725.7	0.05
Transport Equipment	60732	61262	0.87	60960.6	0.38	60887.3	0.25
Miscellaneous Industry	73773	75427	2.24	74448	0.91	74350	0.78
Urban Building	202712	202748	0.02	202727	0.01	202992	0.14
Rural Building	468925	468954	0.01	468937	0.00	469159	0.05
Power Plant Building	63505	63505	0.00	63505	0.00	63505	0.00
Rural Road Building	65385	65384	0.00	65384.9	0.00	65384.9	0.00
Port Road Railway Building	69741	69743	0.00	69750	0.01	69727.3	−0.02
Canal Dyke Other Buildings	24849	24849	0.00	24849.3	0.00	24849.3	0.00
Electricity and Water Gen.	63873	65575	2.66	64547.3	1.05	65517.5	2.57
Gas Extraction and Distribution	13381	13821	3.29	13548.2	1.25	13723.2	2.56
Mining and Quarrying	122755	123347	0.48	123121	0.30	123034	0.23
Wholesale Trade	319266	318501	−0.24	320851	0.50	315107	−1.30
Retail Trade	570200	568759	−0.25	572909	0.47	562724	−1.31
Air Transport	7968	8020	0.66	8000.05	0.40	8001.04	0.41
Water Transport	60465	60404	−0.10	60750.3	0.47	59770.5	−1.15
Land Transport	459193	462160	0.65	462509	0.72	455916	−0.71
Railway Transport	7401	7430	0.39	7449.92	0.65	7335.86	−0.89
Other Transport	21107	21626	2.46	21317.1	0.99	21309.8	0.96
Housing Service	447297	462379	3.37	453342	1.35	456088	1.97
Health Service	176606	181592	2.82	180378	2.14	179614	1.70
Education Service	165821	169158	2.01	167122	0.78	167101	0.77
Public Admin. and Defense	209291	209698	0.19	209530	0.11	209514	0.11
Bank Insurance and Real estate	114315	115859	1.35	115602	1.12	117887	3.12
Professional Service	18863	19257	2.09	19058.9	1.04	19035.3	0.91
Hotel and Restaurant	98804	102106	3.34	100171	1.38	100134	1.34
Entertainment	14425	14990	3.92	14640.3	1.49	105290	629.90
Communication	101551	102670	1.10	101483	−0.07	111028	9.33
Other Services	504964	512370	1.47	507877	0.58	506651	0.33
Information Tech. and E Com	4708	4795	1.85	4742.87	0.74	4748.24	0.85

Source: Authors' calculation

Appendix Table 3: Simulation Outcome in terms of Demand for 86 Commodities

Impact on Commodity Demand	Baseline	Scenario 1		Scenario 2		Scenario 3	
	Value	Value	% Increase	Value	% Increase	Value	% Increase
Paddy Cultivation	576443	599316	3.97	612664	6.28	584892	1.47
Wheat Cultivation	46959	48801	3.92	49874.5	6.21	47669.6	1.51
Other Grain Cultivation	24070	24960	3.70	25055.7	4.09	24421.2	1.46
Jute Cultivation	28012	28071	0.21	28067.2	0.19	28036.2	0.08
Sugarcane Cultivation	18204	18920	3.93	19327.2	6.17	18472.6	1.47
Potato Cultivation	60160	62572	4.01	63970.1	6.33	61055.4	1.49
Vegetable Cultivation	87155	90528	3.87	92513.4	6.15	88426.8	1.46
Pulses Cultivation	57033	59429	4.20	60839.2	6.67	57942.9	1.59
Oilseed Cultivation	27504	28516	3.68	29002.8	5.45	27889.2	1.40
Fruit Cultivation	51273	53432	4.21	54689	6.66	52106.8	1.62
Cotton Cultivation	67700	68071	0.55	67853.9	0.23	67843.1	0.21
Tobacco Cultivation	**3789**	**1314**	**−65.30**	**1372.61**	**−63.78**	**1317**	**−65.24**
Tea Cultivation	6459	6677	3.37	6746.2	4.43	6546.41	1.34
Spice Cultivation	21485	22305	3.82	22544.3	4.93	21799.4	1.46
Other Crop Cultivation	31488	32647	3.68	33188.5	5.40	31924.9	1.38
Livestock Rearing	183592	190758	3.90	194795	6.10	186308	1.48
Poultry Rearing	129011	133786	3.70	134299	4.10	130895	1.46
Shrimp Farming	121612	123587	1.62	124395	2.29	122366	0.62
Fishing	335528	348762	3.94	356520	6.26	340580	1.51
Forestry	210295	214108	1.81	216225	2.82	211802	0.72
Rice Milling	720616	749540	4.01	766441	6.36	731289	1.48
Grain Milling	104744	108917	3.98	111386	6.34	106353	1.54
Fish Process	15486	15836	2.26	16043	3.59	15617.2	0.84
Oil Industry	151435	157170	3.79	160215	5.80	153605	1.43
Sweetener Industry	61484	63936	3.99	65285.5	6.18	62424.3	1.53
Tea Product	6115	6349	3.82	6436.72	5.25	6209.01	1.53
Salt Refining	5861	6079	3.72	6031.01	2.90	5945.9	1.45
Food Process	236642	246090	3.99	251556	6.30	240279	1.54
Tanning and Finishing	23394	23795	1.71	23550.5	0.67	23548.1	0.66
Leather Industry	41772	42511	1.77	42059.2	0.69	42054.9	0.68
Baling	461.68	461.89	0.04	461.799	0.02	461.775	0.02
Jute Fabrication	26814	26818	0.01	26818.2	0.01	26816.8	0.01
Yarn Industry	54690	55479	1.44	55040	0.64	54986.6	0.54
Cloth Milling	142222	143516	0.91	142799	0.41	142804	0.41
Handloom Cloth	133159	138482	4.00	135278	1.59	135136	1.48
Dyeing and Bleaching	24517	25491	3.97	24905.1	1.58	24879	1.48
RMG	370300	371671	0.37	370841	0.15	370814	0.14
Knitting	353226	354669	0.41	353796	0.16	353767	0.15

Impact on Commodity Demand	Baseline	Scenario 1		Scenario 2		Scenario 3	
	Value	Value	% Increase	Value	% Increase	Value	% Increase
Toiletries	9145	9367	2.43	9235.9	0.99	9221.39	0.83
Cigarette Industry	**72038**	**1207**	**−98.32**	**1338.75**	**−98.14**	**1304.03**	**−98.19**
Bidi Industry	**17977**	**304.61**	**−98.31**	**337.769**	**−98.12**	**307.781**	**−98.29**
Saw and Plane	19671	20196	2.67	20028.1	1.81	19923.7	1.28
Furniture Industry	25279	26261	3.88	25660.8	1.51	25720.3	1.74
Paper Industry	27990	24756	−11.55	24568.7	−12.22	27839.7	−0.54
Printing and Publishing	4138	4231	2.26	4190.88	1.27	4304.31	4.01
Pharmaceuticals	73756	76526	3.75	74989.5	1.67	74836.4	1.46
Fertiliser Industry	28390	29198	2.84	29666.5	4.49	28658.2	0.94
Basic Chemical	83270	82657	−0.74	82485.5	−0.94	81765.2	−1.81
Petroleum	247631	252813	2.09	250698	1.24	253240	2.26
Earth ware Industry	13990	14454	3.32	14175.1	1.32	14173.1	1.31
Chemical Industry	25945	26737	3.05	26257.1	1.20	26245.8	1.16
Glass Industry	9734	10055	3.29	9862.39	1.31	9856.03	1.24
Clay Industry	15731	15737	0.04	15734	0.01	15746.8	0.10
Cement M	97804	97815	0.01	97809.4	0.00	97888.3	0.09
Basic Metal	193842	194183	0.18	194100	0.13	194169	0.17
Metal	89169	90030	0.97	89967.1	0.89	90080.6	1.02
Machinery and Equipment	258381	259263	0.34	259250	0.34	258523	0.05
Transport Equipment	135539	136721	0.87	136048	0.38	135884	0.25
Miscellaneous Industry	234897	240162	2.24	237045	0.91	236733	0.78
Urban Building	202712	202748	0.02	202727	0.01	202992	0.14
Rural Building	468925	468954	0.01	468937	0.00	469159	0.05
Power Plant Building	63505	63505	0.00	63505	0.00	63505	0.00
Rural Road Building	65385	65384	0.00	65384.9	0.00	65384.9	0.00
Port Road Railway Building	69741	69743	0.00	69750	0.01	69727.3	−0.02
Canal Dyke Other Buildings	24849	24849	0.00	24849.3	0.00	24849.3	0.00
Electricity and Water Generation	63873	65575	2.66	64547.3	1.05	65517.5	2.57
Gas Extraction and Distribution	13381	13821	3.29	13548.2	1.25	13723.2	2.56
Mining and Quarrying	130779	131410	0.48	131169	0.30	131076	0.23
Wholesale Trade	319266	318501	−0.24	320851	0.50	315107	−1.30
Retail Trade	570200	568759	−0.25	572909	0.47	562724	−1.31
Air Transport	27606	27789	0.66	27717.3	0.40	27720.7	0.41
Water Transport	139019	138879	−0.10	139674	0.47	137421	−1.15
Land Transport	459193	462160	0.65	462509	0.72	455916	−0.71
Railway Transport	7401	7430	0.39	7449.92	0.65	7335.86	−0.89
Other Transport	21107	21626	2.46	21317.1	0.99	21309.8	0.96
Housing Service	447297	462379	3.37	453342	1.35	456088	1.97
Health Service	176606	181592	2.82	180378	2.14	179614	1.70

Impact on Commodity Demand	Baseline	Scenario 1		Scenario 2		Scenario 3	
	Value	Value	% Increase	Value	% Increase	Value	% Increase
Education Service	165821	169158	2.01	167122	0.78	167101	0.77
Public Administration and Defense	228925	229370	0.19	229187	0.11	229168	0.11
Bank Insurance and Real estate	126432	128140	1.35	127855	1.12	130382	3.12
Professional Service	30380	31015	2.09	30695.1	1.04	30657.2	0.91
Hotel and Restaurant	98804	102106	3.34	100171	1.38	100134	1.34
Entertainment	14441	15007	3.92	14656.5	1.49	105406	629.90
Communication	102799	103932	1.10	102730	−0.07	112392	9.33
Other Services	504964	512370	1.47	507877	0.58	506651	0.33
Information Technology and ECom	4948	5039	1.85	4984.72	0.74	4990.36	0.85

Source: Authors' calculation

Appendix Table 4: Simulation Outcome in terms of Factor Returns and Household Income

	Baseline	Scenario 1		Scenario 2		Scenario 3	
	Value	Value	% Increase	Value	% Increase	Value	% Increase
Impact on Factor Returns							
Labour Unskilled	1107770	1125130	1.57	1128760	1.89	1117280	0.86
Labour Skilled	1130940	1143290	1.09	1144940	1.24	1159970	2.57
Capital	1941430	1971080	1.53	1967830	1.36	1977460	1.86
Land	288419	299175	3.73	305406	5.89	292212	1.32
Impact on Household Income							
Rural Landless	300255	304102	1.26	304397	1.36	304678	1.45
Rural Marginal Farmers	283097	287117	1.40	287679	1.59	287170	1.42
Rural Small Farmers	549960	558396	1.51	560352	1.85	557416	1.34
Rural Large Farmers	341538	348071	1.88	350468	2.55	345990	1.29
Rural non-farm poor	433474	438990	1.26	439853	1.45	439225	1.31
Rural non-farm non-poor	1156860	1173960	1.46	1174560	1.51	1175550	1.59
Urban Low Educated	490267	496686	1.29	497902	1.53	495532	1.06
Urban High Educated	1168680	1182850	1.20	1183660	1.27	1191970	1.95

Source: Authors' calculation

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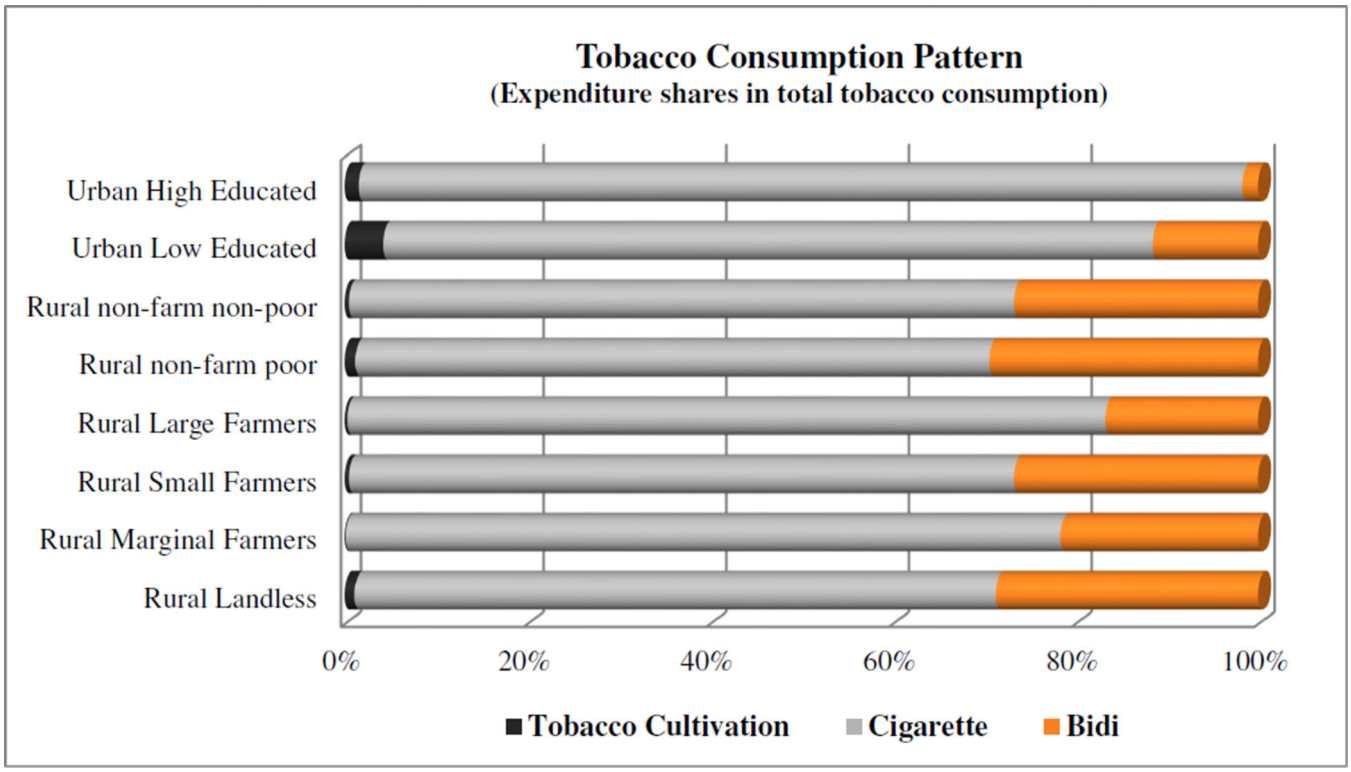

Figure 1.
Pattern of tobacco consumption by household groups in SAM 2006/07
Source: Authors' calculation using Bangladesh SAM 2006/07.

Table 1

Aggregate Social Accounting Matrix (SAM) for Bangladesh, 2006/07

	(1) (Act)	(2) (Comm)	(3) (Fact)	(4) (HH)	(5) (Crptn)	(6) (Indtax)	(7) (Imp Dty)	(8) (Prd Sub)	(9) (ExpSub)	(10) (Govt)	(11) (ROW)	(12) (Pvt Cap)	(13) (Pub Cap)	(14) (Pvt Inv)	(15) (Pub Inv)	Total Income
(1) Activities(Act)		**9375170** (M:86×86)														**9375170** (V:86×1)
(2) Commodities (Comm)	**4807024** (M:86×86)			**3576006** (M:86×8)						**261056** (V:86×1)	**934403** (V:86×1)	**898618** (V:86×1)	**257258** (V:86×1)	**41058** (V:86×1)	**18002** (V:86×1)	**10793424** (V:86×1)
(3) Factors (Fact)	**4468549** (M:4×86)															**4468549** (V:4×1)
(4) Households (HH)			**4200436** (M:8×4)							**110660** (V:8×1)	**413040** (V:8×1)					**4724136** (V:8×1)
(5) Corporation (Crptn)			**268113** (V:1×4)							**6000** (S:1×1)						**274113** (S:1×1)
(6) Indirect taxes (Ind Tax)	**125067** (V:1×86)															**125067** (S:1×1)
(7) Import Duty (Imp. Duty)		**156626** (V:1×86)														**156626** (S:1×1)
(8) Prod. Subsidy (Prd Sub)	**−17473** (V:1×86)															**−17473** (S:1×1)
(9) Export Subsidy (Exp Sub)	**−7998** (V:1×86)															**−7998** (S:1×1)
(10) Government (Govt)				**25860** (V:1×8)	**60350** (S:1×1)	**125067** (S:1×1)	**156626** (S:1×1)	**−17473** (S:1×1)	**−7998** (S:1×1)							**342433** (S:1×1)
(11) Rest of World (ROW)		**1261628** (V:1×86)														**1261628** (S:1×1)
(12) Pvt Capital (Pvt Cap)				**1122271** (V:1×8)	**213763** (S:1×1)							**−396357** (S:1×1)				**939676** (S:1×1)
(13) Public Capital (Pub Cap)										**−53284** (S:1×1)	**−85815**	**396357** (S:1×1)				**257258** (S:1×1)
(14) Private Inv. (Pvt Inv)												**41058** (S:1×1)				**41058** (S:1×1)
(15) Public Inv (Pub Inv)										**18002** (S:1×1)						**18002** (S:1×1)
Total Outlays	**9375170** (V:1×86)	**10793424** (V:1×86)	**4468549** (V:1×4)	**4724136** (V:1×8)	**274113** (S:1×1)	**125067** (S:1×1)	**156626** (S:1×1)	**−17473** (S:1×1)	**−7998** (S:1×1)	**342433** (S:1×1)	**1261628** (S:1×1)	**939676** (S:1×1)	**257258** (S:1×1)	**41058** (S:1×1)	**18002** (S:1×1)	

Note: M = Matrix; V = Vector; and S = Scalar, and the corresponding data dimensions are mentioned in the parentheses**.** All values are in million Bangladeshi Taka (BDT) and represent total amounts of the respective matrices, vectors, or scalars. When read column-wise, the values indicate expenditures of respective accounts; and when read row-wise, the values indicate income for the corresponding accounts. For example, the total transaction amount of 4807024 million BDT between activity (Act) and commodity (Comm) accounts is coming from an 86 by 86 data matrix in the disaggregated SAM reporting how each of the 86 activities makes transactions with each of the 86 commodities in the production process. Similarly, in column 11 rest of world (ROW) account, the total amount of 934403 million BDT originated from the 86 by 1 vector in the disaggregated SAM reporting export amount of each of 86 commodities.

Table 2

Impact Sub-matrices of the Multiplier Matrix (*Ma*)

	Activities	Commodities	Factors	Households
Activities	M_{11} (86×86)	**M_{12}** (86×86) *(Output Multiplier)*	M_{13} (86×4)	M_{14} (86×8)
Commodities	M_{21} (86×86)	**M_{22}** (86×86) *(Demand Multiplier)*	M_{23} (86×4)	M_{24} (86×8)
Factors	M_{31} (4×86)	**M_{32}** (4×86) *(GDP Multiplier)*	M_{33} (4×4)	M_{34} (4×8)
Households	M_{41} (8×86)	**M_{42}** (8×86) *(Income Multiplier)*	M_{43} (9×4)	M_{44} (8×8)

Note: The dimension of each matrix is shown in the parentheses.

Table 3

Ranking of commodities in terms of their backward linkages

PANEL 1		
Ranking of commodities in terms of generating total output multiplier value		
	Value	**Rank**
Top 5 Commodities		
Fish Process	5.08	1
Shrimp Farming	4.86	2
Rice Millings	4.62	3
Hotel and Restaurant	4.55	4
Poultry Rearing	4.55	5
Ranking of Tobacco related Commodities		
Bidi Industry	3.67	**36**
Tobacco Cultivation	2.63	**67**
Cigarette Industry	2.45	**68**
Bottom 5 Commodities		
Fertiliser Industry	0.91	82
Petroleum	0.33	83
Yarn Industry	0.23	84
Basic Chemical	0.07	85
Cotton Cultivation	0.07	86

PANEL 2		
Ranking of commodities in terms of generating total demand multiplier value		
	Value	**Rank**
Top 5 Commodities		
Fish Process	5.46	1
Shrimp Farming	5.22	2
Rice Millings	5.02	3
Poultry Rearing	4.97	4
Hotel and Restaurant	4.96	5
Ranking of Tobacco related Commodities		
Bidi Industry	4.04	**39**
Tobacco Cultivation	3.24	**67**
Cigarette Industry	2.68	**70**
Bottom 5 Commodities		
Toiletries	1.73	82
Petroleum	1.22	83
Yarn Industry	1.21	84

PANEL 2

Ranking of commodities in terms of generating total demand multiplier value

	Value	Rank
Basic Chemical	1.06	85
Cotton Cultivation	1.06	86

Source: Authors' calculation

Table 4

Ranking of Commodities in terms of GDP Multiplier

	Total GDP		Unskilled Labour		Skilled Labour		Capital		Land	
	Value	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**
Top 5 Commodities										
Tea Cultivation	2.26	1	0.63	5	0.40	39	0.57	57	0.65	2
Jute Cultivation	2.23	2	0.68	2	0.47	20	0.66	42	0.42	10
Paddy Cultivation	2.17	3	0.66	3	0.44	26	0.61	51	0.47	9
Shrimp Farming	2.16	4	0.45	31	0.51	11	1.08	3	0.12	24
Baling	2.15	5	0.58	7	0.51	14	0.83	19	0.23	17
Tobacco Commodities										
Bidi Industry	**1.59**	**52**	**0.39**	**46**	**0.41**	**35**	**0.70**	**36**	**0.09**	**55**
Tobacco Cultivation	**1.32**	**61**	**0.36**	**51**	**0.30**	**65**	**0.43**	**68**	**0.23**	**16**
Cigarette Industry	**0.83**	**72**	**0.21**	**71**	**0.22**	**69**	**0.36**	**71**	**0.05**	**73**
Bottom 5 Commodities										
Toiletries	0.32	82	0.08	82	0.09	82	0.14	82	0.02	82
Petroleum	0.08	83	0.02	84	0.02	83	0.04	83	0.00	85
Yarn Industry	0.07	84	0.02	83	0.02	84	0.03	84	0.00	84
Basic Chemical	0.03	85	0.01	85	0.01	85	0.01	85	0.00	86
Cotton Cultivation	0.03	86	0.01	86	0.01	86	0.01	86	0.01	83

Source: Authors' calculation

Table 5

Ranking of Commodities in terms of the Income Generation Effects to Households

	Total Household Income		Rural Landless		Rural Marginal Farmers		Rural Small Farmers		Rural Large Farmers		Rural Non-Farm Poor		Rural Non-Farm Non-Poor		Urban Low Education		Urban High Education	
	Value	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**	**Value**	**Rank**
Top 5 Commodities																		
Tea Cultivation	2.18	1	0.11	25	0.13	1	0.33	1	0.31	2	0.19	3	0.47	16	0.23	5	0.41	37
Jute Cultivation	2.13	2	0.13	6	0.13	2	0.29	4	0.24	9	0.19	2	0.48	14	0.24	2	0.44	22
Paddy Cultivation	2.09	3	0.12	12	0.13	4	0.29	3	0.25	6	0.18	4	0.46	25	0.23	3	0.42	33
Other Services	2.05	4	0.15	1	0.13	3	0.25	13	0.16	17	0.20	1	0.47	17	0.29	1	0.40	38
Pulses Cultivation	2.04	5	0.11	30	0.12	6	0.29	5	0.26	5	0.17	7	0.47	21	0.21	10	0.42	30
Tobacco Commodities																		
Bidi Industry	**1.49**	**51**	**0.10**	**47**	**0.09**	**51**	**0.17**	**53**	**0.10**	**52**	**0.13**	**50**	**0.38**	**50**	**0.15**	**48**	**0.38**	**44**
Tobacco Cultivation	**1.26**	**61**	**0.07**	**65**	**0.08**	**62**	**0.17**	**52**	**0.14**	**22**	**0.11**	**61**	**0.29**	**65**	**0.13**	**59**	**0.28**	**66**
Cigarette Industry	**0.78**	**72**	**0.05**	**71**	**0.05**	**72**	**0.09**	**72**	**0.05**	**72**	**0.07**	**71**	**0.20**	**71**	**0.08**	**71**	**0.20**	**70**
Bottom 5 Commodities																		
Toiletries	0.30	82	0.02	82	0.02	82	0.03	82	0.02	82	0.03	82	0.08	82	0.03	82	0.08	82
Petroleum	0.08	83	0.00	83	0.00	83	0.01	83	0.01	84	0.01	83	0.02	83	0.01	84	0.02	83
Yarn Industry	0.06	84	0.00	84	0.00	84	0.01	84	0.00	85	0.01	84	0.02	84	0.01	83	0.02	84
Cotton Cultivation	0.03	85	0.00	86	0.00	85	0.01	85	0.01	83	0.00	85	0.01	86	0.00	86	0.01	86
Basic Chemical	0.03	86	0.00	85	0.00	86	0.00	86	0.00	86	0.00	86	0.01	85	0.00	85	0.01	85

Source: Authors' calculation

Table 6

Simulation Outcome for the four Endogenous Accounts

	Total Amount (Million Taka)	Change from Baseline (Million Taka)	% change from Baseline
Panel 1: Total Sector (Activity) Output			
Baseline	9375170	--	--
Scenario1	9461370	86200	0.92%
Scenario2	9497030	121860	1.30%
Scenario3	9445180	70010	0.75%
Panel 2: Total Commodity Demand			
Baseline	10793400	--	--
Scenario1	10897300	103900	0.96%
scenario2	10932200	138800	1.29%
scenario3	10871800	78400	0.73%
Panel 3: Total Factor Returns			
Baseline	4468550	--	--
Scenario1	4538680	70130	1.57%
scenario2	4546930	78380	1.75%
scenario3	4546920	78370	1.75%
Panel 4: Total Household Income			
Baseline	4724140	--	--
Scenario1	4790170	66030	1.40%
Scenario2	4798870	74730	1.58%
Scenario3	4797530	73390	1.55%

Source: Authors' calculation