



## **The economic impact of a smokefree United Kingdom: technical report**

Written by Howard Reed of Landman Economics for ASH

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Dr Tessa Langlely, School of Medicine, Division of Epidemiology and Public Health, UK Centre for Tobacco and Alcohol, University of Nottingham

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## 1 Introduction

Smoking is associated with a range of costs to the economy in general and the public finances, which arise due to the health risks associated with tobacco consumption and the associated increases in mortality and morbidity for the smoking population<sup>1</sup> (DHSC 2017). Previous work on the costs of smoking in the UK has focused primarily on the costs to the National Health Service (NHS) and the social care system (Reed, 2021) and the negative effects of smoking on productivity due to a number of factors including smokers having greater higher working-age morbidity and greater employee absenteeism, resulting in lower economic output and lower tax receipts for the Exchequer (Reed 2010; Reed 2020). These costs are enumerated at a local level in the ASH smoking costs ready reckoner (ASH, 2019).

This report looks at a different aspect of the costs of smoking to the economy which has been somewhat neglected in the last two decades although it did feature in empirical research in the 1990s (Buck, Godfrey and Sutton, 1995). This is the economic impact of consumers switching from buying tobacco to buying other goods and services in the economy as smoking prevalence falls.

Consumption of goods and services in the UK economy has multiplier effects because of the derived demand for goods and services used by industries which supply goods and services for final consumption. For example, buying a new car creates demand for metals, electronic components and upholstery as well as marketing and showroom personnel and also petrol, diesel or electricity (depending on how the car is powered). Every pound spent on cigarettes or hand rolling tobacco is a pound not spent on something else in the economy. Therefore, the elimination of smoking consumption reduces demand for intermediate products used in tobacco manufacturing, distribution and retail, but increases demand for other goods and services which consumers buy instead (final demand) as well as the goods and services used to produce those products (intermediate demand).

This paper presents estimates of the economic impact of tobacco consumption falling to zero in the UK, using two metrics: (1) Gross Value Added (GVA – a proxy for Gross Domestic Product at the industry level) and (2) employment (measured as headcount). Estimates are produced for 2018/19 which is the most recent year for which data on patterns of consumption are currently available from the Living Costs and Food Survey (LCF).

In July 2019 the UK Government published a consultation document *Advancing our health: prevention in the 2020s* (Cabinet Office and DHSC, 2019) which announced a smokefree 2030 ambition (defined as smoking prevalence of below 5% of the adult population by 2030), and gave the tobacco industry an ultimatum to make smoking

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<sup>1</sup> there are also certain negative externalities associated with smoking which increase costs, for example passive smoking and fire costs.

obsolete by 2030. This is a shared ambition across government, with HM Treasury aware that, if the ambition is achieved, the tax revenue stream from tobacco (just under £12 billion per year in excise duty and VAT receipts in 2018-19<sup>2</sup>) will no longer exist in the long run. Given this policy context, this report is timely and relevant.

The structure of this paper is as follows. Section 2 outlines previous work on the economic impact of reductions in tobacco consumption from Buck *et al* (1995) as well as recent estimates from the Tobacco Manufacturers Association of the number of people employed in tobacco-related jobs. Section 3 explains the methodology used in this paper in detail. Essentially the approach taken here is an updated version of the methodology used by Buck *et al*. Section 4 presents evidence on the expenditure patterns of households with non-zero tobacco expenditure (“smoker” households) compared to households with zero tobacco expenditure (“non-smoker” households) in the Living Costs and Food Survey data. Section 5 presents the results for the estimated impact of a smokefree UK on Gross Value Added, employment and tax receipts. Section 6 sets the results in the context of the overall impact of a smokefree UK on the public finances including reduced costs to the NHS and social care system, and productivity improvements and longer life expectancy leading to higher tax receipts and lower benefit payments. Section 7 offers conclusions.

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<sup>2</sup> Tobacco duty receipts taken from HMRC (2021); VAT receipts based on author’s calculations.

## 2 Previous work on the economic impact of reduced tobacco consumption

### 2.1 Buck, Godfrey and Sutton (1995)

The most recent analysis of the economic impact of reduced tobacco consumption is by Buck, Sutton and Godfrey (1995) who used Office for National Statistics (ONS) data from 1990 (the most recently available data at the time) and estimated the impact on employment if tobacco consumption were reduced by 40%. The study used data from the Family Expenditure Survey (an earlier version of the Living Costs and Food Survey) to model different ways in which smokers who stop might re-allocate their released tobacco consumption expenditure. It also simulated two different possible government reactions to reduced revenue from tobacco taxation – an increase in VAT, or a reduction in public spending. Under the assumptions the author believed were most reasonable, the analysis projected that a 40% reduction in tobacco consumption would result in an increase in 150,000 jobs in the UK economy.

The methodological approach of the Buck *et al* study is discussed in more detail below when comparing their approach with the approach used here since the current paper is essentially an updated and modified version of their approach.

Other papers referenced by Buck *et al* perform similar calculations for other countries, for example McNicoll and Boyle (1992) for Scotland, and Warner and Fulton (1994) for the state of Michigan in the USA.

## 3 Methodology

### 3.1 Overview

The methodology used in this report is essentially an updated version of the approach taken by Buck *et al* (1995) with some changes reflecting differences in the key datasets used for the analysis and also the fact that a much more comprehensive set of estimates for the other costs of smoking to the economy and public finances now exists compared to the 1990s.

Table 3.1 sets out an overview of the empirical approach. The remainder of this chapter explains the steps in more detail.

**Table 3.1. Overview of empirical approach used in this paper**

<b>Part/Step</b>	<b>Brief description</b>
<b>Part I: expenditure</b>	
1: Estimating initial level of total consumer tobacco expenditure	HMRC data on tobacco duty receipts combined with data on average prices of consumer tobacco products
2: Assumptions about expenditure patterns of smokers who stop	Analysis and comparison of expenditure patterns of current smokers and non-smokers in Living Costs and Food Survey
<b>Part II: Input-Output analysis</b>	
3: Implications for consumer demand at purchaser prices	Conversion of LCF COICOP expenditure categories into I-O product categories
4: Implications for tax revenue from consumption	Analysis of the percentage of final expenditure accounted for as tax in the supply tables
5: Implications for consumer demand at basic prices	Subtracting tax revenue, imports and distribution costs from consumer demand at purchaser prices equals consumer demand at basic prices
6: Multiplier effects of reallocated consumer demand	Type I Multipliers for GVA and employment in I-O tables
<b>Part III: Results</b>	
7: "First round" GVA and tax receipt effects	Multipliers
8: Employment effects	Use ABS data on average costs of employment by SIC code
9: Impact of increased employment on tax receipts	Calculation of additional revenue from income tax, NICs and VAT (from expenditure) for additional workers in each industry
10: Making up for the tax shortfall	Because tobacco is a heavily taxed product, eliminating tobacco spending leads to reallocation of spending towards lower-taxed products. This leads to a shortfall in tax receipts, which is filled by (1) tax revenues from additional output due to multiplier effects; (2) increased tax revenue from higher productivity; (3) reduced public spending due to reduced costs of smoking.

### 3.2 Step 1: The initial level of consumer tobacco expenditure

The estimate of total consumer expenditure on tobacco for 2018-19 used in this paper is made up of an estimate for legally purchased tobacco and an estimate for illicitly purchased tobacco, which are summed together.

#### Legally purchased tobacco

HMRC provides data on total tobacco receipts by tax year (HMRC, 2020) which has been used to derive total consumer spending on tobacco for the tax year 2018-19 by using statistics on the average price of cigarettes and hand-rolling tobacco. The detailed calculations for 2018-19 are shown in Appendix A of this report; Table 3.2 summarises the main calculations for legally purchased tobacco. Total legal consumer tobacco expenditure for 2018-19 is estimated at around £14.3 billion.

**Table 3.2. Estimated consumer spending on legally purchased cigarettes and hand-rolling tobacco, 2018-19**

	£bn		
	Cigarettes	Hand-rolling tobacco	Total
Excise duties	7.748	1.144	9.192
VAT	1.893	0.491	2.385
Total spending	11.359	2.948	14.307
Tax as % of total spending	84.9%	65.6%	80.9%

Data sources:

Excise duty receipts: HMRC (2021); VAT calculated uses (i) data from ONS on price of 20 king size cigarettes in December 2018 (time series CZMP accessed at <https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/czmp>); and (ii) Hand rolling tobacco price based on author's analysis of supermarket websites in December 2020, deflated to December 2018 using on ONS CZMP time series.

#### Illicit tobacco

The estimate for the value of illicit tobacco purchased in 2018/19 is based on two sources:

- i) Estimates for the volume of illicit cigarettes and hand-rolling tobacco (HRT) are from HMRC's *Measuring Tax Gaps* publication (HMRC, 2020).
- ii) Estimates for the average price paid for illicit cigarettes and HRT are taken from surveys by NEMS [explain who NEMS are] of the price paid per pack of 20 cigarettes in Greater Manchester and West Yorkshire. These are the only surveys which asked about the unit price of illicit tobacco.

Table 3.3 shows how the overall estimate of spending on illicit tobacco of approximately £1.3 billion is arrived at. Summing expenditure on illicit tobacco and

legally purchased tobacco gives a total UK consumer tobacco expenditure figure for 2018-19 of approximately £15.6 billion. This paper models the economic impact of a reduction in tobacco expenditure from £15.6 billion to zero.

**Table 3.3. Estimated consumer spending on illicit cigarettes and hand-rolling tobacco, 2018-19**

	<b>Cigarettes</b>	<b>Hand-rolling tobacco</b>	<b>Total</b>
Price per unit	£4.25 per pack of 20 cigarettes	£10.50 per 50g pouch	
Volume of sales	1.25 billion sticks	3.3 million kg	
Total spending (£bn)	531.3	735.0	<b>1,266.3</b>

Data sources: Volume of sales from HMRC (2020). Price per unit from NEMS (2018).

### 3.3 Step 2: Assumptions about expenditure patterns of smokers who stop smoking

Data from the Living Costs and Food Survey for 2018-19 are used to analyse the expenditure patterns of households with positive tobacco expenditure (“smoker” households) and compare them with expenditure for households with zero tobacco expenditure (“non-smoker” households). The LCF is a repeated cross-sectional annual survey of expenditure for approximately 5,000 households for year. Most of the expenditure information (including expenditure on tobacco) is collected using expenditure diaries over a two-week period<sup>3</sup>.

Expenditure patterns are analysed using the United Nations COICOP (Classification of Individual Consumption by Purpose) which breaks down expenditure into 12 categories and 35 subcategories (listed in Appendix B of this paper). The key objective is to establish how much difference there is between expenditure patterns for non-smoking households and smoker households, both across the whole sample and at different points in the distribution of total expenditure (we analyse expenditure by quartile). The results from this analysis are shown in Section 4. Overall, COICOP patterns of consumption for smoker households excluding tobacco are fairly similar to non-smoker households when analysed at the household level<sup>4</sup>. Accordingly, the

<sup>3</sup> The fortnightly diary information is supplemented by questions in the LCF regarding regular payments over a longer time period (such as utility bills) which might not be captured within a 2-week window.

<sup>4</sup> Note that because this analysis is at household level, it is possible that there may be larger differences between adult smokers and non-smokers at the individual level which are not clear at the household level due to aggregation across smokers and non-smokers in households with positive tobacco expenditure. Without more detailed data on individual-level tobacco expenditure, it is difficult to analyse this possibility further.

reallocation of consumer expenditure from tobacco to other goods and services is modelled under three different assumptions:

- **Scenario 1** assumes that ex-smoker households' reallocated spending follows the same pattern as current non-smoker household expenditure patterns in the LCF.
- **Scenario 2** assumes that ex-smoker households' reallocated spending follows the same pattern as current smoker household expenditure patterns *excluding tobacco spending*.
- **Scenario 3** is a population-weighted average of scenarios 1 and 2 (i.e. assuming average expenditure patterns across all LCF households, excluding tobacco spending).

Ideally I would have modelled the patterns of people who quit smoking recently but this is not possible because there is no one data source which features data on the full range of consumer expenditure *and* data on smoking history. The Understanding Society (USoc) panel survey has data on smoking history and tobacco expenditure but not a full range of other expenditure data, whereas the LCF has household expenditure data but no information on individual smoking status or smoking history. Appendix A compares the characteristics and attributes of current smokers in Wave 10 of USoc with ex-smokers who stopped smoking between Waves 2 and 9 of USoc, ex-smokers who stopped smoking before Wave 2, and people in USoc who have never smoked to assess whether the characteristics of ex-smokers are more similar to current smokers than never-smokers, or vice-versa, or if they are different from both groups. The results show that the average group characteristics of ex-smokers across a range of attributes such as age, income, educational attainment and health status lie somewhere between current smokers and those who have never smoked. The results from the USoc analysis give us more confidence that using Scenarios 1, 2 and 3 above is a valid approach.

### 3.4 Step 3: Implications of reduction in tobacco expenditure for consumer demand at purchaser prices

The empirical analysis in this report uses **Input-Output (“I-O”) tables** to simulate the effect of a reduction in consumer tobacco expenditure on the economy<sup>5</sup>. I-O tables present a simplified model of the economy showing how each product in the economy relates to inputs of other products (or alternatively, how each industry in the economy relates to other industries). The Product-by-Product I-O tables show the combination of products used to produce a set quantity (say, £1,000 worth) of each product in the economy (in combination with labour inputs, i.e. employees plus

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<sup>5</sup> For a more detailed explanation of I-O model that is accessible to non-specialist readers, see Howse (2017).

self-employed workers). The Input-Output analysis in this paper proceeds across Steps 3 to 7 of the methodology. In Step 3, the patterns of expenditure across the 35 COICOP subcategories in the LCF are mapped to 103 categories in the ONS's Classification of Products by Activity (CPA) categories which are the inputs into the Product-by-Product I-O table. This mapping is published in the ONS's *Supply and Use Tables* publication (ONS, 2020a). This mapping is performed using LCF expenditure information under each of the three scenarios for reallocation of consumer expenditure set out in Step 2.

### 3.5 Step 4: Implications of consumption patterns for tax revenue

The reallocation of consumer expenditure from tobacco products to other goods and services in the economy has consequences for the amount of expenditure tax revenue received by the UK Government. Tobacco is taxed heavily because of the negative consequences of tobacco consumption for health and wellbeing. The ONS publishes a **supply table** (ONS 2020a) which shows, for each of the 103 CPA categories of product in the UK economy, the following information:

- Total domestic output of products at basic prices
- Total imports of goods and services
- Distributors' trading margins
- Taxes minus subsidies
- Total domestic output of products at purchaser prices.

*Purchaser prices* – the prices paid by final consumers – include taxes minus subsidies, whereas *basic prices* – the prices used as inputs into the I-O tables – exclude them. The relationship between supply of products at purchaser prices and supply of products at basic prices is as follows:

Total domestic output of products at basic prices

*Plus* imports of goods and services

*Plus* distributors' trading margins

*Plus* taxes less subsidies on products

*Equals* total supply of products at purchaser prices.

In Step 4, the “net tax content” of each CPA product category – defined as taxes less subsidies as a proportion of total supply of products at purchaser prices – is calculated. In 2016 (the year used for this part of the analysis, as it is the most recent year for which full I-O tables are currently available) the net tax content of each CPA product category ranged from minus 1.9% on scientific research and development

services (due to the fact that the UK government provides subsidies to encourage research and development spending) to 43.8% on refined petroleum products. Alcoholic beverages and tobacco products (combined into one category in the CPA classification) had the second highest tax content of any product category, at 40.3%. The overall average tax percentage across all products was 5.2%. The implication of these results is that reallocation of consumer expenditure from tobacco to other products is likely to result in a reduction in government revenues from indirect taxation. The results in Section 5 below show that this is indeed the case and there is a substantial shortfall in tax to be made up – this is discussed further in Section 3.13 below.

### **3.6 Step 5: Implications for consumer demand at basic prices**

Because the Input-Output table uses consumer demand at basic prices for each product category as the input rather than consumer demand at purchaser prices, it is necessary to use the supply table to convert demand at purchaser prices (from Step 3) into demand at basic prices. This is a simple exercise which involves re-scaling demand by a factor equal to (demand at basic prices divided by demand at purchaser prices) for each product.

### **3.7 Step 6: Multiplier effects of reallocation of consumer demand**

Step 6 of the modelling uses the multipliers derived from the ONS's Product-by-Product Input-Output table for 2016 to derive the additional Gross Value Added (GVA) and employment costs arising from the reallocation of consumer expenditure from tobacco to other goods and services under the three scenarios.

In order to use the multipliers, expenditure at basic prices by product category (as calculated in Step 5) has to be converted from the 103 CPA categories to 64 product categories used in the I-O table. For the most part this is a straightforward reclassification exercise; the exact conversion mapping is set out in Appendix C.

The GVA multipliers show the impact on economic activity of the additional consumer expenditure across the range of goods and services. GVA is a proxy for Gross Domestic Product (the most commonly used measure of economic output at the national level) derived by summing output at the industry level and then removing "intermediate" outputs which are used as inputs into the production process for other industries (to avoid double counting). Thus, the calculated GVA impacts are a good proxy for the impact of eliminating tobacco consumption on overall GDP.

The employment cost impacts show the increase in employee remuneration (plus employer National Insurance Contributions) arising from the hiring of additional workers to satisfy the additional product demand in the UK economy. In Step 7 (Section 3.10) below these are converted into estimates of additional employment.

### 3.8 Assumptions about positive and negative impacts of tobacco expenditure falling to zero

The analysis by Buck *et al* (1995) took into account the negative consequences for the economy of a reduction in tobacco expenditure as well as the positive consequences of increased expenditure across other product categories, using an Input-Output table for 1990 which featured tobacco as a specific product category. The product classification used in the I-O tables for 2016 (the most recent year for which full tables currently exist) uses an extensively revised set of product categories compared to 1990, and tobacco no longer appears as a separate category in the 2016 table. Instead, tobacco products are combined with food and beverages in a single category. This means that it is not possible to model the negative multiplier impacts of reduced tobacco expenditure using the product-by-product I-O tables. However, it is possible to model the impacts of reduced tobacco expenditure using the industry-by-industry I-O tables, which feature tobacco combined with alcoholic beverages as a particular product category. While this will not produce results that are as accurate as Buck *et al*, it is the best that can be done with the data currently available.

Employment in tobacco manufacturing in the UK fell from about 40,000 workers to 12,000 between 1970 and 1991 (Buck *et al*, 1995) and since then has declined to zero, or a number very close to zero. There are some jobs in tobacco distribution, product research and marketing and lobbying, but the Tobacco Manufacturers Association claims that total direct employment in UK tobacco companies is “around 5,000” (TMA, 2017)<sup>6</sup>. This means that the negative impacts of reducing tobacco consumption to zero are likely to be small, even when multiplier effects are taken into consideration. This report uses the TMA estimate of 5,000 as a measure of employment in the tobacco industry which disappears as a result of the transition to a smoke-free UK.

### 3.9 Type I and Type II multipliers

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<sup>6</sup> It is not clear from TMA (2017) whether all the quoted figures of around 5,000 jobs are based in the UK or whether it includes personnel based offshore. To the extent that the latter is the case, the negative impacts on UK employment of reducing tobacco consumption would be even smaller.

The multipliers calculated by the ONS (ONS, 2020b) are “Type I” multipliers – these include the **indirect** boost to GVA and employment costs arising from the supply chain for each of the products in the I-O table. “Type II” multipliers are a broader type of multiplier which includes indirect effects plus **induced** effects. Induced effects are “second round” effects arising from additional consumer spending from the extra people employed as a result of the indirect boost to employment. The additional employment in the supply chain gives rise to additional consumer spending because overall employment – and therefore the total amount of disposable income – in the economy has risen. Type II multipliers are bigger than Type I multipliers because they include induced effects as well as indirect effects.

ONS does not currently publish Type II multipliers for the UK economy because of concerns about the robustness of the induced effects (the assumptions underlying I-O analysis and Type I and Type II multipliers are explained in Section 3.12 below). Therefore, the multiplier effects included in this paper are based on Type I multipliers only, and should be viewed as a conservative estimate of the potential total effects of consumer demand reallocation arising from a smokefree UK.

### 3.10 Step 7: “First round” GVA and tax receipt effects

The Type I multipliers in the I-O tables are used to estimate the GVA impacts of the reallocation of consumer expenditure from tobacco products to other goods and services in line with the three scenarios outlined above. By combining the estimates for additional output of each product category with the estimates for the tax content of each CPA product category from Step 4 (aggregated into I-O product categories), it is possible to derive estimates for the amount of additional indirect tax revenue collected by the government as a result of the extra expenditure on other goods and services. This has to be balanced against loss of expenditure tax revenue from the disappearance of tobacco consumption. As explained in Section 3.5 above, because tobacco is heavily taxed compared to most other goods and services, the reallocation of spending from tobacco to other goods and services results in an overall reduction in tax receipts even when multiplier effects on additional economic output are taken into consideration. However, “second round” tax receipts resulting from the additional employment generated by the reallocation of consumer expenditure also have to be taken into account; this is covered in Step 9 (Section 3.12) below. There are also other (mainly positive) fiscal impacts of the end of smoking in the UK, which are discussed in Step 10 (Section 3.13).

### 3.11 Step 8: Employment effects

In Step 8, the estimates of additional employee remuneration arising from the reallocation of consumer spending from tobacco to other goods and services are converted into estimates for additional employment in the economy. This is done by using data on the average cost of employment per worker – comprising wages plus employer National Insurance contributions and pension contributions – from the ONS’s 2018 Annual Business Survey (ABS), which gives figures for total employment costs and total numbers of workers employed by industry (ONS, 2020b). Because the ABS only covers businesses in the non-financial private sector, data from the Annual Survey of Hours and Earnings (ASHE), which covers the whole economy including the financial services sector and public sector workers, is used to estimate the relationship between employment costs and number of workers employed in these sectors (ONS, 2018). This procedure allows us to calculate estimates for the increase in employment arising from the reallocation of consumer spending from tobacco to other goods and services.

To link the ABS and ASHE data to the Product-by-Product I-O table, I constructed an industry-to-product mapping using Standard Industrial Classification (SIC) codes and the product codes in the I-O table. This is set out in Appendix D of this report.

The employment effects estimated in this report are based on two different measures: (i) a headcount measure and (ii) a full-time equivalent (FTE) measure. According to the UK Labour Force Survey, around 27 per cent of UK employment is part-time (defined as less than 30 hours per week) rather than full-time (30 hours or more per week). FTE employment estimates are lower than headcount estimates because they treat part-time jobs as fractions of full-time jobs and report a result for the increase in employment as if it were entirely composed of full-time employees. Currently the ONS does not produce regular estimates of FTE multipliers in its I-O table publications. However, it is possible to construct FTE multipliers using the SIC codes in the LFS microdata, adjusting the headcount employment multipliers to take account of the proportion of full-time employees in each industry.

### **3.12 Step 9: Impact of additional employment on tax receipts**

The results from Step 8 for additional employment by industry are used to estimate additional tax receipts across four categories of tax: (a) income tax, (b) employee National Insurance Contributions (NICs), (c) employer NICs, and (d) VAT and excise duties. The revenue estimates for income tax and NICs are calculated based on average annual earnings of employees in each industry. The VAT estimates are based on assumptions from the House of Commons Library (2012) about the marginal propensity to consume earnings from additional employment across the economy and the implications for indirect tax receipts.

The estimates in this paper for additional tax revenue arising from extra employment will be biased downward for two reasons:

- (1) The combined income tax and NICs schedule is progressive, with marginal rates rising as income increases. This means that using average earnings in each industry will understate the average additional tax receipts arising from increased employment in that industry.
- (2) The analysis does not take into account reduced expenditure on Universal Credit (or tax credits for claimants still on the legacy tax credit system) due to increased gross earnings. This will result in a reduction of spending on these transfer payments leading to higher *net* tax revenues.

The reason both of these factors are not taken into account in the modelling is due to the technical complexity of accounting for non-linearities in the tax and NICs system and modelling the means test for Universal Credit and tax credits. The use of additional tax revenue estimates that are downward biased means that the results from this paper are likely to be a conservative estimate of the potential gains to the public finances from achieving a smokefree UK.

### 3.13 Step 10: Estimating the overall impact of a smokefree UK on the public finances

As shown in the results in Section 5, the high tax content of consumer spending on tobacco means that there is a substantial shortfall in tax arising from the elimination of tobacco spending in the UK. This is partly offset by additional tax revenue from consumer spending on other goods and services (taking multiplier effects into account) as well as the increased receipts of income tax, NICs and expenditure taxes estimated in Step 9. However, this still leaves a revenue gap of approximately £7 billion according to the results in Section 5.

One response to the resulting shortfall in the public finances arising from the elimination of tobacco consumption in the UK would be to raise other taxes to fill the gap. This is one option explored by Buck et al (1995) who model an increase in VAT rates (and the consequent multiplier effects arising from reduced demand at basic prices, i.e. after tax) to restore fiscal balance. However, achieving a smokefree UK would have a number of other benefits to the public finances, including:

- Savings to the NHS because it would no longer have to bear the costs of treatment for a range of health conditions related to smoking (DHSC, 2017);
- Savings in local authority expenditure on social care (Reed, 2021);
- Increased tax revenue arising from higher employment and earnings for ex-smokers (Reed, 2020);

- Increased tax revenue arising from lower probability of premature mortality for working age employed people (Reed, 2010);
- Lower benefit payments for chronic ill-health arising from premature morbidity caused by smoking (Reed, 2010).

Set against this, longer life expectancy arising from the elimination of smoking would lead to higher state pension payments (Reed, 2010).

Taking all of these public finance impacts into account it is likely that the savings to the Exchequer from eliminating smoking in the UK are more than enough to close the tax gap arising from the absence of tobacco duty receipts. This also fits with the UK Government's longer-term strategy of phasing out reliance on tobacco receipts by 2030 (Cabinet Office/DHSC, 2019). Section 6 contains detailed calculations of the overall impact of achieving a smokefree UK on the public finances.

### 3.14 Limitations of input-output modelling

It is important to note that input-output modelling has significant limitations as an approach to modelling the economic impact of changes to consumer behaviour. In particular the I-O framework assumes (a) fixed prices for goods and services, and (b) a fixed production technology. These may be reasonable assumptions in the short run (e.g. one or two years) but they become increasingly inaccurate over longer time frames. However, there is no other currently available methodology for modelling the economic impacts of consumer expenditure shifts across a whole set of different product categories (due to the complexity involved in relaxing the fixed-price and fixed-technology assumptions)<sup>7</sup>.

### 3.15 Steady-state analysis

It should be noted that the methodology for this report models the impact of moving from annual expenditure of £15bn on tobacco to zero as two "snapshots" – in other words we do not try to model the dynamics of the transition to a smokefree UK or how long it would take, or which smokers would quit first, what the mechanism would be, etc. If the transition path to a smokefree UK were modelled using a dynamic approach this would e.g., probably produce different a different pattern of results in each time period, but a dynamic modelling strategy would be much more complex to implement.

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<sup>7</sup> Alternative models which allow for flexible prices and/or forecast changes in technology to exist (e.g. Dynamic Stochastic General Equilibrium models) but these models normally assume that the consumption aspect of the economy is a single, undifferentiated and homogeneous product.

## 4 Expenditure patterns of non-smoker and smoker households in the Living Costs and Food Survey

### 4.1 Overall expenditure

Table 4.1 shows the expenditure patterns for “non-smoker” households (those with zero expenditure on tobacco) and “smoker” households (those with positive expenditure on tobacco) in the 2018-19 Living Costs and Food Survey. The expenditure patterns *exclude* tobacco purchases (which are an average of 6.3% of total expenditure for smoker households); rather, the aim is to establish the extent to which expenditure patterns for smoker and non-smoker households are similar, when tobacco expenditure is discounted. The COICOP categories in the Table are listed in order of share of total expenditure for non-smokers, ranging from food (10.8%) to hospital services (0.0%).

Table 4.1 shows that for most of the 35 COICOP expenditure categories, average expenditure for smoker households as a proportion of total (non-tobacco) expenditure in the LCF is within 1 percentage point of non-smoker households. The exceptions are as follows:

- Rental payments for households who rent their home (11.6% of expenditure for smoker households compared to 6.5% for non-smoker households);
- Imputed rental payments for households who own their own home (either outright or with a mortgage)<sup>8</sup>; 4.2% of expenditure for non-smoker households compared to 3.0% for smokers);
- Package holidays (6.3% of expenditure for non-smoker households compared to 3.7% for smokers).

With these three exceptions, the expenditure profile for smoker and non-smoker households looks fairly similar and can justify the approach taken here of using three different expenditure scenarios for how ex-smokers allocate the spending power that is freed up when they quit smoking. These scenarios correspond to the three columns of the table as shown in the bottom row of Table 4.1. (The rightmost column, corresponding to scenario 3, shows a weighted average of the non-smoker and smoker household expenditure patterns. Approximately 17 per cent of households in the LCF have positive tobacco expenditure, so scenario 3 is closer to scenario 1 than scenario 2).

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<sup>8</sup> Treatment of housing payments for owner-occupiers is complicated by two factors. One is that mortgage repayments involve an element of saving as well as consumption (due to the house being an asset as well as a consumption good). The other is that households who have paid off their mortgage (i.e. outright owners) are consuming housing services even though they do not make any explicit payments to do so. Therefore, the COICOP classification includes an imputation of rental payments for owner-occupier households as a component of total consumption.

**Table 4.1. Breakdown of overall expenditure by COICOP category, non-smoker and smoker households, Living Costs and Food Survey 2018-19**

COICOP Code	Description	Percentage of total spending		
		Non-smokers	Smokers	Wt. av.
C01_1	Food	10.5%	11.1%	10.6%
C11	Restaurants and hotels	9.8%	9.5%	9.8%
C07_2	Operation of personal transport equipment	9.4%	9.9%	9.5%
C12	Miscellaneous goods and services	9.0%	8.0%	8.8%
C04_1	Actual rentals for households	6.5%	11.6%	7.4%
C09_6	Package holidays	6.3%	3.7%	5.9%
C07_1	Purchase of vehicles	4.8%	4.0%	4.7%
C04_5	Electricity, gas and other fuels	4.7%	5.4%	4.8%
C05_1	Furniture, furnishings, carpets etc	4.6%	4.0%	4.5%
C04_2	Imputed rentals for households	4.2%	3.0%	4.0%
C09_4	Recreational and cultural services	3.8%	3.1%	3.7%
C03_1	Clothing	3.6%	4.0%	3.7%
C09_3	Other recreational equipment etc	2.7%	2.8%	2.7%
C07_3	Transport services	2.4%	2.9%	2.5%
C04_4	Water supply and miscellaneous dwelling services	1.9%	2.0%	1.9%
C08_3	Telephone and telefax services	1.8%	2.5%	1.9%
C02_1	Alcoholic beverages	1.7%	2.2%	1.8%
C04_3	Maintenance and repair of the dwelling	1.6%	0.9%	1.5%
C05_6	Goods and services for household maintenance	1.4%	1.2%	1.4%
C10	Education	1.1%	1.0%	1.1%
C09_5	Newspapers, books and stationery	1.1%	0.8%	1.0%
C01_2	Non-alcoholic beverages	1.0%	1.4%	1.0%
C09_1	Audio-visual, photo and info processing equipment	0.9%	1.4%	1.0%
C06_1	Medical products, appliances and equipment	0.8%	0.7%	0.8%
C05_3	Household appliances	0.8%	0.4%	0.7%
C06_2	Outpatient medical services	0.8%	0.4%	0.7%
C03_2	Footwear	0.7%	1.0%	0.7%
C05_5	Tools and equipment for house and garden	0.6%	0.3%	0.6%
C09_2	Other major durables for recreation and culture	0.5%	0.1%	0.5%
C05_2	Household textiles	0.4%	0.4%	0.4%
C05_4	Glassware, tableware and household utensils	0.2%	0.2%	0.2%
C08_2	Telephone and telefax equipment	0.2%	0.1%	0.2%
C08_1	Postal services	0.1%	0.1%	0.1%
C06_3	Hospital services	0.0%	0.0%	0.0%
	Total consumption	100.0%	100.0%	100.0%
	Expenditure patterns correspond to scenario:	1	2	3

## 4.2 Savings rates for smokers and non-smokers

An important implication of the modelling assumptions used in this report is that ex-smokers switch their consumption from tobacco products to other goods and services while leaving their overall level of expenditure unchanged. Another possibility is that overall expenditure falls because ex-smokers save some (or all) of the money that they would have been spending on cigarettes, or use the money for repayment of debt. Table 4.2 shows average (mean) expenditure and income levels for non-smoker and smoker households in the 2018-19 LCF data. On average, non-smoker households' expenditure is equal to 85 per cent of their household income; the remaining 15 per cent is not spent (and so is saved<sup>9</sup>, or used for paying interest on and repayment of debt). The corresponding figure for smoker households is expenditure equal to 83 per cent of income, with 17 per cent used for savings and debt interest and repayments. The overall savings rates for smoker and non-smoker households are similar, making us more confident in the assumption that ex-smokers' switch of spending from tobacco to other goods and services leaves their overall expenditure unchanged.

**Table 4.2. Average expenditure and income for non-smoker and smoker households, Living Costs & Food Survey 2018-19**

	Non-smoker households	Smoker households
Average weekly expenditure	£620	£541
Average weekly disposable income	£726	£656
Ratio of average expenditure to average income	0.85	0.83

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<sup>9</sup>Aggregate UK data from the Office for National Statistics show that in 2018-19 the household savings ratio was around 7 per cent, which is lower than the overall figure of 15 per cent (combining smoker and non-smoker households) for the 2018-19 LCF survey data. However, the 15% figure for the LCF includes debt repayments and interest paid on outstanding debts as well as savings, whereas the ONS 7% figure is for savings only.

## 5 Economic impact of shifting consumer expenditure from tobacco to other goods and services

This section shows the results from the main part of the analysis – the final economic impact in 2018/19 if expenditure were reduced to zero and consumer expenditure were shifted to other goods and services. As with the previous section, the results are presented for the three different scenarios representing different assumptions about how ex-smokers reallocate their expenditure (as set out in Section 3.3).

### 5.1 Overall Impacts on GVA and employment

Table 5.1 shows the estimated impacts on GVA and employment after taking account of the indirect effects (steps 1 to 8 in Table 3.1). In all three scenarios, I assume that 100% of tobacco spending – estimated at £15.573 billion in 2018/19 – is reallocated to consumer spending.

**Table 5.1. Implications of a smokefree UK for Gross Value Added, costs of employment, and headcount employment**

	Scenario		
	1	2	3
Initial Tobacco expenditure (2018-19) £bn	15.573	15.573	15.573
Reduction in spending on tobacco	100%	100%	100%
Increased spending on other goods and services (consumer prices)	15.573	15.573	15.573
Increased demand at basic prices (£bn)	8.921	9.223	8.975
Increase in GVA (£bn)	13.010	13.953	13.174
Increase in employment remuneration (£bn)	11.341	12.448	11.533
Increase in number of people employed (headcount)	460,193	498,217	466,802
Increase in number of people employed (full-time equivalents)	346,438	376,490	351,661

The results from Table 5.1 show that the elimination of tobacco consumption in the UK is forecast to lead to an increase in demand at basic prices of approximately £8.9 billion (in Scenario 1), £9.2 billion (in Scenario 2) and £9.0 billion (in Scenario 3).

Multiplier effects lead to a total increase in GVA of just over £13 billion in Scenario 1, just under £14 billion in Scenario 2 and just under £13.2 billion in Scenario 3. This is equivalent to around 0.6 per cent of UK Gross Domestic Product for 2018.

Meanwhile, the forecast increase in total employment remuneration (i.e. the wage bill plus employer NICs payments) ranges from just over £11.3 billion to just over £12.4 billion. The forecast increase in the headcount employment total ranges between 460,000 workers (in Scenario 2) and 500,000 workers (in Scenario 3). Measured as full-time equivalent employment the estimated increase ranges between approximately 345,000 and 375,000 full-time workers.

It is instructive to compare the results in this paper with the previous results for the economic impact of eliminating tobacco consumption in the UK by Buck *et al* (1995). Their results suggested that in 1990, a 40% reduction in tobacco consumption would lead to an increase in employment of 150,000. Scaling this up by a factor of 2.5, achieving a smokefree UK in 1990 would have been projected to increase UK employment by around 375,000. This is the same as the result for full-time workers from Scenario 3 in this paper. There is in fact no particular reason to expect the employment effects to be that similar across this report and the study by Buck *et al*, given the changes in the UK economy, the reduction in employment in the tobacco sector, the growth in population, the increase in the price of tobacco in real terms and the reduction in smoking prevalence over the last 25 years.

## 5.2 The impact on tax receipts

Table 5.2 shows the results from this analysis for the gross and net “tax gaps” arising from the disappearance of tobacco tax revenue if consumer expenditure on tobacco were to cease. The disappearance of tobacco tax revenue leaves a gross shortfall in tax revenue of just under £11.6bn, which comprises the disappearance of £9.2bn of tobacco duty receipts plus a £2.4bn fall in VAT receipts. Just under £800 million of this is filled by the additional indirect taxes arising from the reallocation of consumer spending to other goods and services. A larger sum of tax revenue – between approximately £3.55 billion (in Scenario 1) and £3.93 billion (in Scenario 2) is raised from increased income tax, NICs and indirect tax payments resulting from the additional employment shown in Table 5.1. This means that overall, between 37 and 40 per cent of the gross tax gap is recovered through reallocation of consumer expenditure and multiplier effects, leaving a remaining net tax gap ranging from £6.86 billion (in Scenario 2) to £7.26 billion (in Scenario 1).

**Table 5.2. Gross and net “tax gap” arising from reallocation of consumer spending from tobacco to other goods and services (£bn)**

	<b>Scenario</b>		
	<b>1</b>	<b>2</b>	<b>3</b>
Gross “tax gap” from disappearance of tobacco tax revenue	11.577	11.577	11.577
Additional indirect taxes from reallocation of consumer spending to other goods and services	0.771	0.794	0.775
Increase in tax payments resulting from additional employment	3.549	3.926	3.614
Net “tax gap”	7.256	6.858	7.187

## 6 The overall public finance impacts of a smokefree UK

The results in Section 5 show that when only the direct effects of consumers switching spending from tobacco to other goods and services are considered, there is a net tax gap of approximately £7.5 billion (in Scenario 3). However, if the UK were to become smokefree then there would be a range of other impacts on the public finances which are mainly positive (i.e. they would increase tax revenues and/or reduce public spending and pressures on public spending). Table 6.1 sets out estimates of these other public finance impacts using the most up-to-date evidence for the UK. The table starts with the net tax gap from Table 5.2 and subtracts the following other public finance impacts as follows:

- The total current cost of smoking to the public finances is estimated at £2.5 billion, which is the most recent estimate from DHSC's Tobacco Control Plan (DHSC, 2017).
- The total cost of smoking to local authority social care budgets is estimated at £1.2 billion in other recent work I have carried out for ASH (Reed, 2021);
- Increased tax receipts from previous work I have carried out for ASH improvements to productivity arising from higher employment and earnings of non-smokers compared to smokers, controlling for other factors which affect labour market outcomes (Reed, 2020). The total loss in UK productivity from smoking was estimated at £14.1 billion. To calculate the impacts of a smokefree UK on productivity I assume that productivity increases by £14.1 and that 32 per cent of the gross increase in productivity accrues to the Exchequer in the form of higher income tax, NICs and indirect tax revenues. This is in line with the results from Step 9 of the analysis in this paper (the impact of increased employment from reallocation of consumer spending from tobacco products to other goods and services on tax receipts). Hence, I estimate that tax revenue would increase by £4.4 billion as a result of higher productivity from eliminating smoking.

Table 6.1 does not include three other potential impacts on the public finances for which I do not currently have up-to-date estimates of the size of the impacts:

1. Increased tax revenue arising from lower probability of premature mortality for employed people of working age;
2. Reduced spending on benefits related to chronic ill health arising from premature morbidity caused by smoking;
3. Increased spending on state pension payments due to longer life expectancy.

Analysis of the cost-benefit and public finance impacts of reductions in smoking prevalence by Reed (2010) established that the size of the increased spending on state pensions due to longer life expectancy was significantly lower than the combined improvement in the public finance due to increased tax revenues from

lower probability of premature mortality and reduced spending on benefits related to ill health. The cost estimates from that 2010 research are now somewhat out of date, but it still seems very likely that the combined effect of these three impacts on the public finances would be positive (i.e. improving the government’s fiscal position)<sup>10</sup>.

In addition, the public finance impacts in Table 6.1 will only be partially realised in the short-run; if the rate of smoking prevalence declines to zero there will nonetheless continue to be costs to the NHS and social care systems, and productivity losses for ex-smokers, for some years to come, until these ‘legacy’ costs eventually disappeared. Therefore Table 6.1 has been labelled ‘long-run estimate’ to make it clear that these calculations do not include short-term and medium-term transitional and legacy effects.

Finally, it is worth noting that the reduced cost pressures on the NHS and social care systems arising from a smokefree UK are unlikely to result in ‘bankable’ savings in public spending because the cost pressures on health and social care spending are severe. Rather, it is more likely that resources will be freed up to spend more on other health and social care needs which are not smoking-related. However, this still represents an implicit improvement in the government’s fiscal position because of a reduction in cost pressures on these services and productivity gains from improvements in population health.

**Table 6.1. Long-run estimate of overall long-run public finance impacts of a smokefree UK based on latest available data (scenario 3), £bn**

Item	Estimate to nearest £100m
Starting net tax gap (from Table 5.2)	7.5
<b>Public service impacts:</b>	
Reduction in NHS costs	2.5
Reduction in local authority social care costs	1.2
<b>Fiscal impacts of productivity improvements:</b>	
Extra tax revenue from higher productivity	4.4
<b>Total public finance impacts (public service impacts plus fiscal impacts):</b>	8.1
<b>Starting net tax gap minus other impacts = Final tax gap</b>	<b>-0.6</b>

Data sources: as specified in main text

<sup>10</sup> Work is currently underway to produce up-to-date calculations of these three effects, which will be included in a revised version of the paper at a future date.

The results from Table 6.1 show that the reduction in NHS costs and local authority social care costs plus the additional tax revenues from higher productivity are enough by themselves to completely cover the net tax gap in the long run (in fact, a small annual surplus of £600 million per year is forecast). This suggests that a smokefree strategy would be self-financing in the long run. Taking the additional impacts explained above but not (yet) included here into consideration, it is likely that a smokefree UK would *improve* the public finances relative to their current position.

## 7 Regional breakdown of employment impacts

The estimates presented so far in this paper have been at the national (United Kingdom) level. This section presents regional breakdowns of the national employment impacts shown in Section 5. Ideally, the methodology for estimating regional employment impacts of achieving a smokefree UK would mirror the methodology for national estimates, using regional equivalents of the data sources listed in Section 3. Unfortunately, this is not possible because the Office for National Statistics does not publish regional Input-Output tables<sup>11</sup>. As an alternative, this report uses estimates based on two different data sources for which regional breakdowns are available:

- a) Total tobacco spending in the UK. The regional breakdown of tobacco spending is estimated using data from the Living Costs and Food Survey for 2018-19 (which has regional identifiers for each household in the survey).
- b) Employment in the industries which benefit from ex-smokers switching expenditure from tobacco products to other goods and services. This is estimated by taking the pattern of employment impacts by industry (using the results from Step 8 of the methodology in Section 3) and disaggregating by workplace region using the data in the January-March 2020 Labour Force Survey<sup>12</sup>.

Estimates (a) and (b) should be viewed as approximations of the true regional employment effects only. In the absence of regional I-O tables, they are the best estimates available. Table 7.1 shows the regional breakdown of employment impacts using regional tobacco spending from the LCF, which Table 7.2 shows the regional breakdown using regional employment from the LFS. There are some significant differences between the two tables. For example, the estimated employment impacts in North West England, Eastern England and Northern Ireland are much larger in

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<sup>11</sup> The Scottish Government, Welsh Government and the Northern Ireland Statistics Research Agency (NISRA) publish I-O tables for Scotland, Wales and Northern Ireland respectively, but there is no equivalent data for the English regions.

<sup>12</sup> The January-March 2020 LFS dataset was used for this analysis because more recent employment data are affected by the Covid-19 pandemic.

Table 7.1, whereas the estimated impacts in London, South East England and Scotland are much larger in Table 7.2.

**Table 7.1. Regional breakdown of employment impacts of a smokefree UK: estimates based on pattern of tobacco spending**

<b>Region</b>	<b>Tobacco spend (£m)</b>	<b>percentage</b>	<b>employment impact (headcount)</b>	<b>employment impact (FTE)</b>
England:				
North East	243.4	4.4%	20,572	15,497
North West	691.3	12.5%	58,438	44,024
Yorkshire and the Humber	456.4	8.3%	38,583	29,066
East Midlands	377.1	6.8%	31,877	24,014
West Midlands	441.9	8.0%	37,350	28,137
Eastern	495.5	9.0%	41,889	31,556
London	591.4	10.7%	49,988	37,658
South East	534.5	9.7%	45,180	34,036
South West	430.6	7.8%	36,398	27,420
Wales	196.9	3.6%	16,644	12,539
Scotland	810.6	14.7%	68,524	51,622
N Ireland	252.7	4.6%	21,360	16,092
<b>Total</b>	<b>5522.2</b>	<b>100.0%</b>	<b>466,802</b>	<b>351,661</b>

**Table 7.2. Regional breakdown of employment effects of a smokefree UK: estimates based on employment in industries affected by switch in consumer spending from tobacco to other goods and services**

<b>Region</b>	<b>employment percentage</b>	<b>employment impact (headcount)</b>	<b>employment impact (FTE)</b>
England:			
North East	5.2%	24,202	18,233
North West	8.4%	39,097	29,454
Yorkshire and the Humber	7.4%	34,590	26,058
East Midlands	7.4%	34,445	25,949
West Midlands	9.0%	42,134	31,742
Eastern	4.0%	18,627	14,032
London	14.9%	69,539	52,387
South East	17.7%	82,492	62,145
South West	9.5%	44,523	33,541
Wales	4.8%	22,273	16,779
Scotland	9.2%	43,140	32,499
N Ireland	2.5%	11,739	8,843
<b>Total</b>	<b>100.0%</b>	<b>466,802</b>	<b>351,661</b>

The LFS data used to construct Table 7.2 have a more detailed regional breakdown which subdivides some of the regions in Table 7.2 (for example, North West England is subdivided into Greater Manchester, Merseyside and “Rest of North West”). Appendix E presents employment breakdown results using this more detailed regional breakdown.

## 8 Conclusions

Based on rigorous and commonly used input-output modelling techniques, combined with the most up-to-date available evidence on the costs of smoking, this report shows that reducing smoking prevalence in the UK to zero would deliver significant economic benefits. Specifically, achieving a smokefree UK – in which smoking prevalence in the population was reduced to zero – would increase UK economic output (measured using Gross Value Added) by between £13 billion and £14 billion, and increase employment by around 345,000 to 375,000 full-time equivalent jobs.

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## **Appendices**

The tables for the appendices are presented in the spreadsheet accompanying this technical paper.

### **Appendix A. Estimate of consumer spending on cigarettes and hand-rolling tobacco for 2018-19**

See “Appendix A” tab in spreadsheet

### **Appendix B. COICOP expenditure categories**

See “Appendix B” tab in spreadsheet

### **Appendix C. Conversion of expenditure from CPA codes to Input-Output product categories**

See “Appendix C” tab in spreadsheet

### **Appendix D. Mapping of industry codes in ABS/ASHE wage data to Input-Output product categories**

See “Appendix D” tab in spreadsheet

### **Appendix E. More detailed version of Table 7.2 using disaggregated LFS workplace region variable**

See “Appendix E” tab in spreadsheet