

COUNTRY REPORT: UK

1. DESCRIPTION OF THE INDIRECT TAX SYSTEM IN THE UK

This section describes the indirect tax system for the UK. First we explain the value added tax rates, which goods and services they apply on, and which exemptions there are to the standard rates. We then summarize excises for each product category. Finally we list the other notable indirect taxes besides VAT and excises. Information generally refers to June 30th in a given year, unless specified otherwise.

1.1 Value Added Tax

Currently in the UK there are three VAT rates: a standard rate and two reduced rates. The most recent adjustment to the rates has been applied at the beginning of 2011. The progression of UK VAT rates is presented in Table 1.1.

Table 1.1: Overview of changes in VAT rates (1975-2016)

	1975	1976/77	1979/80	1991/92	1994/95	1997/98	2009	2010	2011 4 th January
Higher rate	25%	12.5%	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Standard	8%	8%	15%	17.5%	17.5%	17.5%	15%	17.5%	20%
Reduced	n/a	n/a	n/a	n/a	8%	5%	5%	5%	5%
Zero rate	0%	0%	0%	0%	0%	0%	0%	0%	0%

Source: <https://www.gov.uk/vat-rates> and <http://www.which.co.uk/money/tax/guides/uk-taxes-compared/how-vat-rates-have-changed/>

There are no major changes in the taxation of product categories during the period 2011-2016. Table 1.2 provides an overview of goods that are not taxed at VAT standard rate.

Table 1.2 Overview of reduced VAT product categories (2012)

Standard rate	Ice cream and similar products, confectionaries, potato crisps, roasted or salted nuts, other similar food products, soft-drinks. Alcoholic beverages. Tobacco. Clothing and footwear not for children. Water charges. Housing furniture, Housing equipment. Non-NHS medicines and medical equipment. Other medical products (i.e. plasters). Non-hospital ambulance services. Most private transports (see exceptions listed below). Taxi and hired cars with driver; water travel season ticket; car leasing. Communications. Recreation. Food supplied in course of catering or take-away hot food products.
Reduced rate	Fuel and power supplied for domestic use. Water. Central heating installation.
Zero rate	Most food and non-alcoholic beverages (see exceptions among standard rate list). Clothing and footwear for children. Regular housing payment (i.e. water charges). NHS prescription charges and payments. Animal drawn vehicle. Most public transports (see some exceptions in other groups). Purchase of motor caravan (second hand) ¹ ; plants, flowers and seeds, fertilisers, insecticides; subscriptions to sports and social clubs; books; newspapers; magazines and periodicals; cards, calendars, posters and other prints. All education related items. School meals. Double glazing, bedroom fittings, food stamps, other food related expenditure.

Exempted	Purchase of spectacles, lenses, prescription sunglasses; Accessories/repairs to spectacles/lenses; Non-optical appliances and equipment (eg wheelchairs etc); NHS medical services; Private medical services; NHS optical services; Private optical services; NHS dental services; Private dental services; Services of medical analysis laboratories and x-ray centres; Services of NHS medical auxiliaries; Services of private medical auxiliaries; Hospital services. Garage rent, MOT. Live entertainment theatre, concerts, shows; Museums, zoological gardens, theme parks; Cassette hire (library), CD hire (library); football pools stakes; Bingo stakes; lottery stakes; bookmaker, tote, other betting stakes; scratch-cards; TV licence. Insurance premiums (i.e. for household appliances; contents insurance, structure insurance, vehicle insurance, medical insurance). Property transactions. Mortgage interests. Money spent abroad. Motoring fines. Council tax; vehicle tax; money set abroad; maintenance allowance expenditure; credit cards interest payments.
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Notes: ¹ in 2011 only, from 2012 charged at standard VAT rate.

Sources: <https://www.gov.uk/guidance/rates-of-vat-on-different-goods-and-services>
<https://www.gov.uk/government/collections/vat-notice-alphabetical-order>

The importance of VAT as a revenue source is illustrated in Table 1.3. VAT makes up a little more than a fifth (21%) of the total revenue of the central government in 2012 (our base year) and it counts for almost a fourth of GDP. Over time, the importance of revenue from VAT has increased from 18% of government revenues in 2005 to 22% of government revenue in 2015.

Table 1.3: VAT revenue 2005, 2010-2015

	2005	2010	2011	2012	2013	2014	2015
VAT (£ bl)	72.9	83.5	98.3	100.6	104.7	111.4	115.4
GDP (£ bl)	404.9	414.7	420.1	424.5	433.3	446.5	457.0
Total HMRC receipts (£ bl)	402.9	453.6	472.3	473.8	493.6	515.3	533.7
VAT as % of government revenues	18%	18%	21%	21%	21%	22%	22%
VAT as % of GDP	18%	20%	23%	24%	24%	25%	25%

Source: <http://www.which.co.uk/money/tax/guides/uk-taxes-compared/how-vat-rates-have-changed/> and https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/517448/Mar16_Receipts_NS_Bulletin_final.pdf

1.2 Excise duties and prices

In the UK, in addition to VAT, excises duties are levied on: alcoholic beverages and tobacco, fuel, betting games and gambling, insurance premiums, and air passenger duty.

1.2.1 Alcoholic beverages

Alcohol duties are included in the price paid for beer, cider or perry, wine or 'made-wine', and spirits. Made-wine is any alcoholic drink made by fermentation that is not beer, cider, perry, spirits or wine. Table 1.4 reports excises duties on alcoholic beverages from 2011 to 2016. Prices vary by type of drink and alcoholic strength (percentage of alcohol). For beers and spirits the excises are based on the volume of pure alcohol contained, while for intermediaries, wine

Table 1.4: Excises on alcoholic beverages (GBP per unit, 2011-2016)

	2011	2012	2013	2014	2016	unit
<i>Product and ABV strenght</i>						
<u>Beers</u>						
<i>More than 1.2%, up to 2.8%</i>	0p	9.76p	9.17p	8.10p	8.10p	Per litre for each % of alc
<i>More than 2.8%, up to 7.5%</i>	18.57p	19.51p	19.12p	18.37p	18.37p	l/da
<i>More than > 7.5%</i>	18.57p	20.79p	21.68p	23.85p	23.85p	l/da
<u>Cider</u>						
<i>Still: More than 1.2%, up to 7.5%</i>	35.87p	37.68p	39.66p	38.87p	38.87p	per litre
<i>Still: More than 7.5%, up to 8.5%</i>	53.84p	56.55p	59.52p	58.75p	58.75p	per litre
<i>Sparkling: More than 1.2% , up to 5.5%</i>	35.87p	37.68p	39.66p	38.87p	38.87p	per litre
<i>Sparkling: More than 5.5%, up to 8.5% alc.</i>	233.55p	245.32p	258.23p	264.61p	268.99p	per litre
<u>Wine</u>						
<i>Still: More than 1.2%, up to 4%</i>	74.32p	78.07p	82.18p	84.21p	85.60p	per litre
<i>Still: More than 4%, up to 5.5%</i>	102.21p	107.36p	113.01p	115.80p	117.72p	per litre
<i>Still: More than 5.5%, up to 15%</i>	241.23p	253.39p	266.72p	273.31p	277.84p	per litre
<i>Still: More than 15%, up to 22%</i>	241.23p	253.39p	266.72p	273.31p	370.41p	per litre
<i>Sparkling: More than 5.5, up to 8.5%</i>	223.55p	245.32p	258.23p	264.61p	268.99p	per litre
<i>Sparkling: More than 8.5%, up to 15%</i>	308.99p	324.56p	341.63p	350.07	355.87p	per litre
<u>Spirits</u>						
<i>Wine and made-wine of more than 22% ABV</i>	£25.52	£26.81	£28.22	£27.66	£27.66	Per litre of pure alcohol (l of pa)
<i>Other spirits</i>	£25.52	£26.81	£28.22	£27.66	£27.66	l of pa

Notes: da=degree alcohol, pa=pure alcohol.

Source: <https://www.gov.uk/tax-on-shopping/alcohol-tobacco> and https://ec.europa.eu/taxation_customs/business/excise-duties-alcohol-tobacco-energy_en

and other beverages made by fermentation they are based on the volume of the finished product. For example, in 2016 if you buy a litre of 5.0% strength lager, the beer duty paid amounts at $18.37 \times 5.0 = 91.85$ pence per litre. Which works out at just over 52p per pint (about 0.568 litre). With effect from 1 October 2011, an additional duty, High Strength Beer Duty is charged on beers exceeding 7.5% alcohol by volume. This duty is charged at £5.48 per hectolitre % in 2016, which means 5.48p per litre. As each litre contains 7.5 degrees of alcohol, then the consumer pays $5.48 \times 7.5 = 41.1$ p per litre, which is 23.34p per pint (or 0.568 litre).

1.2.2 Tobacco

Tobacco excises in the UK consist of two parts. Firstly, there are specific excises that are levied on cigarettes (per 1000 units) as well as hand rolling tobacco, cigars and other tobacco products. In addition to this, there are ad valorem excises levied as a certain percentage of the retail price of cigarettes, hand rolling tobacco, cigars and other tobacco products. The relevant information pertaining to the UK tobacco excises is presented in **Table 1.5**.

Table 1.5: Excises on tobacco products (2011-2016)

	2011	2013	2014	2015	2016
<u>Specific excises</u> (£ per 1000 units)					
<i>Cigarettes</i>	£154.95	£176.22	£184.10	£189.49	£196.42
<i>Hand rolling tobacco</i>	£151.90	£172.74	£180.46	£185.74	£198.10
<i>Cigars</i>	£193.29	£219.82	£229.65	£236.37	£245.01
<i>Other tobacco products</i>	£84.98	£96.64	£100.96	£103.91	£107.71
<u>Ad valorem excises</u> (% of retail price)					
<i>Cigarettes</i>	16.5%	16.5%	16.5%	16.5%	16.5%
<i>Hand rolling tobacco</i>	n/a	n/a	n/a	n/a	n/a
<i>Cigars</i>	n/a	n/a	n/a	n/a	n/a
<i>Other tobacco products</i>	n/a	n/a	n/a	n/a	n/a

Source: <https://www.gov.uk/tax-on-shopping/alcohol-tobacco> and https://ec.europa.eu/taxation_customs/business/excise-duties-alcohol-tobacco-energy_en

1.2.3 Energy products

Energy excises are levied on petrol, diesel, and other fuels used in vehicles or for heating (i.e. liquid fuels, natural gas, gas oil). These products are usually subject to standard VAT at 20%, unless they are supplied for domestic use. In that case they are charged VAT at the reduce rate of 5%. The excise taxation of electricity has been graded into two categories. Electricity in the UK is not subject to any excises.

The excises levied on energy usage in the UK are presented in Table 1.6.

Table 1.6: Excises on energy products (euro per unit, 2011-2016)

	2011	2016	unit
Fuel			
<i>Petrol, diesel, biodiesel and bioethanol</i> ¹	57.95p	57.95p	Per liter
<u>Liquefied petroleum gas (LPG)</u> ²			
<i>Propellant use</i>	31.61p	31.61p	Per kilo
<i>Industrial/Commercial use</i>	0	0	Per kilo
<i>Heating for business</i>	0	0	Per kilo
<i>Heating for NON business</i>	0	0	Per kilo
<u>Natural Gas</u> ³			
<i>Propellant use</i>	£5.67	£5.67	Per gigajoule
<i>Industrial/Commercial use</i>	0	0	Per gigajoule
<i>Heating for business</i>	0	0	Per gigajoule
<i>Heating for NON business</i>	0	0	Per gigajoule
<i>...As fuel in vehicles (e.g. biogas)</i>	24.70p	24.70p	Per kilo
<i>"Fuel oil" burned in a furnace or used for heating</i>	10.849p	10.70p	Per liter
<u>Gas oil</u> ⁴ :			
<i>Propellant use</i>	57.95p	57.95p	Per liter
<i>Industrial/Commercial use</i>	11.14p	11.14p	Per liter
<i>Heating for business</i>	11.33p	11.14p	Per liter
<i>Heating for NON business</i>	11.33p	11.14p	Per liter
<i>Coal and Coke</i>	0	0	Per liter
Electricity			
<i>Non-business use</i>	n/a	n/a	MWh
<i>Fixed contribution for the use of electricity</i>	n/a	n/a	year

Source: https://ec.europa.eu/taxation_customs/business/excise-duties-alcohol-tobacco-energy_en

Notes:

¹ VAT rate of 20% - non domestic use. Domestic use for deliveries of less than 2300 litres - VAT rate of 5%, except biofuels which are rated 20%.

² LPG is chargeable for duty only when used in road vehicles. For off-road motor/engine use the rate is NIL. For domestic heating and deliveries less than 2300 litres – VAT rate of 5%..

³ Natural gases are chargeable only when for use in road vehicles (24,70 pence per kilo – EUR 0, 0,28). For off-road motor/engine use the rate is NIL. For domestic heating and deliveries less than 2300 litres - VAT rate of 5%.

⁴ VAT rate of 20.00% - non domestic use. Domestic use for deliveries of less than 2300 litres – VAT rate of 5%.

1.2.4 Gambling duties

Different gambling duties are included in the cost of: bingo, casino games, betting at a bookmaker's, pool betting (e.g. football pools), lottery tickets, fruit or quiz machines, online or telephone gambling. Excises on gambling are ad valorem excises that are levied as a certain percentage of the retail price of the specific good. Table 1.7 presents the percentages applied to each type of gambling from 2011.

Table 1.7: Gambling excises (2011-2016)

	2011	unit
Bingo	10%	
Casino games	Btw 15% and 50%	depending on how much money the casino makes
Normal betting at a bookmaker's	15%	
Financial spread betting	3%	
Other types of spread betting	10%	
Pool betting (e.g. football pools)	15%	
National Lottery tickets	12%	
Fruit or quiz machines with a prize up to £10 that cost up to 20p to play	5%	
All other fruit or quiz machines	20%	
Online or telephone gambling	15%	

Source: <https://www.gov.uk/taks-on-shopping/gambling-duties>

1.2.5 Insurance premiums

Insurance Premium are not subject to VAT, however an Insurance Premium Tax (IPT) is usually included in the price paid. The rate of IPT depends on the type of insurance and who supplies it.

From 4th of January 2011, the standard rate of Insurence Premium Tax (IPT) is 6% on most types of insurance, including car, pet and home insurance (previously it was 5%).

A higher rate of 20% (17.5% before 4th of January 2011) is payable for travel insurance, and insurance arranged by the supplier (rather than an insurance company) on: vehicles, including hired vehicles (but the standard 6% rate is charged on ordinary motor insurance); electronic goods and other household appliances (including gas central heating but not mobile phones).

There are two exemptions to IPT: life insurance and income protection insurance.

1.2.6 Air Passengers duties

Air Passenger Duty (APD) is usually included in the price paid for flights from the UK, although VAT is usually not paid on the cost of flights. The amount paid on APD depends on the distance and travel's class. There are exceptions for flights from Northern Ireland and the Scottish Highlands and Islands. However, the FRS does not provide departure and/or destination of flights, so we are not able to take these differences into account. Table 1.8 summaries Air Passenger duties from 2010 to 2016.

Table 1.8: Air Passengers excises (2010-2016)

	2010	2012	2013	2014	2015	2016	unit
<u>Reduce¹ rate APD</u>							
<i>0-2,000 miles from London</i>	£12	£13	£13	£13	£13	£13	Per person
<i>2,001-4,000 miles from London</i>	£60	£65	£67	£69	£71	£73	Per person
<i>4,001-6,000 miles from London</i>	£75	£81	£83	£85	(*)		Per person
<i>Over 6,001 miles from London</i>	£85	£92	£94	£97	(*)		Per person
<u>Standard² rate APD</u>							
<i>0-2,000 miles from London</i>	£24	£26	£26	£26	£26	£26	Per person
<i>2,001-4,000 miles from London</i>	£130	£130	£134	£138	£142	£146	Per person
<i>4,001-6,000 miles from London</i>	£150	£162	£166	£170	(*)		Per person
<i>Over 6,001 miles from London</i>	£174	£184	£188	£194	(*)		Per person
<u>Higher³ rate APD</u>							
<i>0-2,000 miles from London</i>	n/a	n/a	£52	£52	£78	£78	Per person
<i>2,001-4,000 miles from London</i>	n/a	n/a	£268	£276	£426	£438	Per person
<i>4,001-6,000 miles from London</i>	n/a	n/a	£332	£340	(*)		Per person
<i>Over 6,001 miles from London</i>	n/a	n/a	£376	£388	(*)		Per person

Notes: ¹ Reduce rate is normally charged on the lowest class of travel available on the aircraft. However, if there's more than 40 inches between each row of seats the standard rate is charged.

² Standard rate is usually charged on any other class of travel in the aircraft.

³ Higher rate is usually charged on travel in aircrafts weighing 20 tonnes or more that are only equipped to carry up to 18 passengers (i.e. private or business jets).

(*) From April 2015 distance from London is distinguished only being above or below 2000 miles.

1.2.7 Tax revenue from excise duties

Table 1.9 shows the importance of the different excises as revenue sources.

Table 1.9: Proceeds from excise duties (2010-2015)

		2010	2011	2012	2013	2014	2015
% of gov. revenue	alcohol	1.95%	1.85%	1.82%	1.90%	2.17%	2.07%
	tobacco	1.98%	1.90%	1.77%	1.84%	2.12%	2.02%
	Betting & Gaming	0.35%	0.32%	0.32%	0.33%	0.35%	0.34%
	Air Passenger Duty	0.22%	0.23%	0.44%	0.42%	0.45%	0.48%
	Insurance Premium Tax	0.58%	0.54%	0.51%	0.51%	0.54%	0.53%
% of GDP	alcohol	1.94%	1.90%	1.95%	1.97%	2.22%	2.27%
	tobacco	1.97%	1.95%	1.90%	1.91%	2.17%	2.20%
	Betting & Gaming	0.35%	0.33%	0.35%	0.34%	0.35%	0.37%
	Air Passenger Duty	0.22%	0.23%	0.47%	0.43%	0.46%	0.52%
	Insurance Premium Tax	0.58%	0.55%	0.54%	0.53%	0.56%	0.58%

Source: <https://www.gov.uk/government/publications/public-sector-finances-bulletin> and https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/553738/Aug_16_Receipts_NS_Bulletin_Final.pdf and https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/553997/Aug_16_Receipts_Table_Final.xlsx

1.2.8 Prices

Table 1.10 lists average consumer prices as programmed in EUROMOD for items subject to excises in the UK. The selection is based on both data availability of prices and expenditure details available from HBS.

Table 1.10: Average consumer prices of items subject to excises (GBP per unit, 2011-2016)

	2011	2012	2013	2014	2015	2016	Units
<u>Alcohol beverages</u>							
Spirits (Whisky and Vodka, 40%)	20.73	20.86	<i>22.12⁴</i>	23.22	24.06	23.94	Litre
Wine	5.43	5.38	5.56	5.84	6.00	5.90	Litre
Sparkling wine	6.14	6.14	6.34	6.66	6.84	6.72	Litre
Ciders	3.19	3.20	3.31	3.47	3.57	3.51	Litre
Lager ¹	5.21	5.21	5.38	5.65	5.80	5.70	Litre
Beer ²	4.78	4.75	4.78	4.78	4.58	4.33	Litre
<u>Tobacco</u>							
Cigarettes	6.63	7.09	7.72	8.23	9.16	9.40	20 cigarettes
Cigars	4.10	4.30	4.63	5.37	6.57	8.41	small pack
Hand rolling tobacco ³	7.28	7.85	8.46	9.80	12.00	15.36	25g
<u>Fuel and power</u>							
Gas oil	0.68	0.71	0.70	0.62	0.46	0.46	Litre
Oil fuel	0.58	0.59	0.57	0.50	0.34	0.18	Litre
Petrol	1.33	1.35	1.34	1.27	1.11	1.08	Litre
Diesel	1.39	1.42	1.40	1.33	1.15	1.09	Litre
Air fares	169.68	171.42	172.64	174.23	174.03	174.03	Flight

Notes:

¹ Used as average price for certain flavour alcoholic beverages with relatively low alcohol content (i.e. 3-7% alcohol by volume).

² Average price of beer of any strength.

³ Used as average price of other tobacco products.

⁴ Values marked in italics are updated using specific ONS Consumer Price indexes from <https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceindices>

Source:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/557623/weekly_fuel_prices_03_1016.xlsx

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/511466/table_221.xls

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/556021/table_411.xls

<http://www.ias.org.uk/uploads/tax%20and%20duty%20alcohol%20bulletin%20oct%202013.xls>

<http://www.the-tma.org.uk/tma-publications-research/facts-figures/uk-cigarette-prices/>

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223839/aviation-forecasts.pdf

(see Annex A.4 for average air fares. Fares are for a single one-way journey. They are national averages across all traffic, weighted by different regional markets and for business and leisure passengers)

1.3 Other indirect taxes

Other indirect taxes¹ levied in the UK are raised through a system of licences. Among these the main ones are:

- 1) vehicle excises duties, levied on road vehicles annually;
- 2) Landfill tax: it was introduced on 1 October 1996. It is currently levied at two rates: a lower rate of £2.50 per tonne for disposal to landfill of inactive waste (waste that does not decay or contaminate land) and a standard rate of £80 per tonne for all other waste. The government has set a floor of £80 per tonne until 2019–20. Landfill tax is forecast to raise £1.3 billion in 2014–15.
- 3) Climate change levy and carbon price floor: it was introduced in 2001 and charged to industrial and commercial use of electricity, coal, natural gas and liquefied petroleum gas, with the tax rate varying according to the type of fuel used. The main aim of the levy was to help to reduce carbon dioxide emissions by 20% in the UK by 2010. The tax does not apply to fuels used in the transport sector.
- 4) Aggregate levy: it was introduced in 2002 to reduce the environmental costs associated with quarrying.
- 5) Stamp duty land tax (SDLT): it applies to purchases of properties or land over a certain amount in England, Wales and Northern Ireland. In Scotland instead Land and Buildings transaction tax is paid.

2. DATA

This section provides a summary of the micro-datasets used in this analysis for the UK and discusses the sources of data used for the validation test.

Since EUROMOD constitutes the backbone of this project, and the underlying dataset to the simulation model in 2012 is 2012/13 micro-data from the Family Resource Survey (FRS), we use FRS 2012/13 to run the latest available EUROMOD version (G4.1+). Although FRS contains detailed information on gross incomes and other key household characteristics, it lacks information on expenditures and consumption that are essential for the calculation of indirect taxes. In order to enrich the FRS data with expenditures, we analyse the UK Household Budget Survey (HBS) and impute expenditures for each household in FRS as described in the main report. Also for consistency reasons we use comparable definitions of disposable household income for both surveys, excluding imputed rents for owner-occupiers, and taking account of alimonies paid or received.

A detailed description of the UK input database for EUROMOD based on the UK FRS 2012/13 can be found in De Agostini and Sutherland (2016).² This section discusses more in detail the UK Household Budget Survey.

¹ See for more details <https://www.gov.uk/government/collections/vat-excise-duties-and-other-minor-industry-specific-duties-and-levies>

² De Agostini and Sutherland (2016) "United Kingdom 2011-2015 Country Report."
https://www.euromod.ac.uk/sites/default/files/country-reports/year6/Y6_CR_UK_final_13-04-2016.pdf

Table 2.1 Database description

UK	
Year 2012 (income reference period)	
EUROMOD database	UK_2012_a2
Original name	FRS 2012/13
Provider	Department for Work and Pension (DWP)
Year of collection	2012-13
Period of collection	2012 Q2 – 2013 Q1 (most in 2012)
Income reference period	Current years income
Coverage	Private households
Sample size	46,420 individuals 20,196 households
<hr/>	
HBS database	HBS_UK_2012
Original name	Living Costs and Food Survey
Provider	Office for National Statistics (ONS)
Year of collection	2012
Period of collection	January-December 2012
Income reference period	Current year income
Coverage	Private households
Sample size	13,150 individuals 5,593 households

Source: DWP, Family Resources Survey 2012/13 <https://www.gov.uk/government/statistics/family-resources-survey-2012-to-2013>

ONS, Living Costs and Food Survey 2012
<https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/methodologies/livingcostsandfoodsurvey>

2.1 HBS description

The household expenditure data used in this report are drawn from the detailed expenditure diaries of the UK household budget survey for the calendar year January-December 2012. It has been conducted each year in the UK since 1957. From 1957 to March 2001 the Family Expenditure Survey (FES) and National Food Survey (NFS) provided information on household expenditure patterns and food consumption. In April 2001 these surveys were combined to form the Expenditure and Food Survey (EFS). In 2008 a selected group of UK household surveys, conducted by the Office for National Statistics (ONS), were combined into one Integrated Household Survey (IHS). The EFS was part of it and in anticipation of this, the EFS moved to a calendar-year basis in January 2006. The EFS questionnaire became known as the Living Costs and Food (LCF) module of the IHS in 2008, to accommodate the insertion of a core set of IHS questions.

The basic unit of the LCF survey is the household. Each individual aged 16 and over in the household is asked to keep diary records of daily expenditure for two weeks. Information about regular expenditure, such as rent and mortgage payments, is obtained from a household interview along with retrospective information on certain large, infrequent expenditures such as those on vehicles. Children aged 7 to 15 are asked to keep a simplified version of the diary.

Detailed questions are asked about the income of each adult member of the household. In addition, personal information such as age, sex and marital status is recorded for each household member.

The LCF sample for Great Britain is a multi-stage stratified random sample with clustering. It is drawn from the Small Users file of the Postcode Address File (PAF) – the Post Office’s list of addresses. All Scottish offshore islands and the Isles of Scilly are excluded from the sample because of excessive interview travel costs. Postal sectors are the primary sample unit. 638 postal sectors are randomly selected after being arranged in strata defined by Government Office Regions (sub-divided into metropolitan and non-metropolitan areas) and two 2001 Census variables: socio-economic group of the head of household and ownership of cars. The Northern Ireland sample is drawn as a random sample of addresses from the Land and Property Services Agency list.

2.2 Sample descriptives

The LCF records household expenditures on different items at a number of different levels of detail including detailed COICOP³ codes. The ONS aggregates expenditures and produces total expenditure per household for each category in the survey week before the data are released. However, for the purpose of this analysis and for comparability across countries, we aggregated these commodities into one group of durable expenditures⁴ and 15 commodity groups of non-durable expenditures, following the COICOP aggregation principles, as follows:

1. Food, non-alcoholic beverages
2. Alcoholic beverages
3. Tobacco
4. Clothing and footwear
5. Home fuels and electricity
6. Rents (excluding imputed rents)
7. Household services
8. Health
9. Private transport
10. Public Transport
11. Communication
12. Recreation and culture
13. Education
14. Restaurants
15. Other goods and services

The 2012 survey sample consists of 13,150 individuals in 5,593 households (see Table 2.1). The overall response rate for the 2012 LCF was 52 per cent in Great Britain.

Table 2.1 summarises the information about the two surveys used in this analysis.

³ European Standard Classification of Individual Consumption by Purpose.

⁴ Spending on durable goods includes purchases of furniture, floor covering, decorative objects, lamps, household goods made of textile such as mattresses, pillows and curtains, large household appliances such as heating systems, furnaces, freezers, washing machines, microwave ovens and coffee-makers, dinnerware, household goods such as scales, tools for the house and the garden, and vehicles such as cars, caravans, bicycles and motorcycles. Using such a broad definition limits the number of zero observations in durable expenditures.

Table 2.2 Mean (unequalised) monthly household disposable income and total expenditure by income decile, HBS (2012)

Category	Label	Income decile group										All
		1	2	3	4	5	6	7	8	9	10	
	Household disposable income	652.5	1026.6	1350.8	1729.3	1924.2	2367.6	2742.7	3189.1	4143.0	5206.3	2432.9
	Total household expenditures	1050.6	1022.3	1310.2	1534.7	1613.5	1928.9	2125.5	2247.5	2916.6	3403.4	1915.2
1	Food and non-alcoholic beverages	174.1	185.5	213.2	236.3	230.3	263.6	281.5	264.2	314.4	295.0	245.8
2	Alcoholic beverages	17.5	18.0	19.8	21.9	28.7	33.4	41.5	41.2	53.1	62.1	33.7
3	Tobacco	25.1	18.8	21.0	20.6	21.3	25.5	22.2	18.5	20.3	11.1	20.4
4	Clothing and footwear	53.2	54.7	63.1	78.0	83.5	95.9	115.1	124.5	153.2	194.3	101.5
5	Home fuels, electricity and water	107.7	105.3	119.7	126.4	120.5	138.1	142.2	143.8	158.9	160.1	132.3
6	Housing and rents	173.4	123.3	177.1	202.2	218.7	238.7	232.7	258.3	330.1	395.7	235.0
7	Household goods and services	14.7	15.5	21.6	19.8	23.8	24.3	24.6	24.4	35.8	39.5	24.4
8	Health	8.8	12.4	14.7	15.0	21.1	34.1	25.9	25.0	37.6	81.5	27.6
9	Private transport	59.5	71.7	97.8	112.1	135.9	163.3	201.6	204.1	263.9	263.5	157.3
10	Public Transport	22.1	18.2	16.4	21.4	16.2	25.3	27.6	34.9	53.8	63.9	30.0
11	Communication	38.1	41.6	50.9	52.7	52.9	65.5	67.1	71.7	78.0	78.6	59.7
12	Recreation and culture	95.0	110.4	161.0	191.8	199.3	243.8	302.2	301.7	403.3	499.0	250.7
13	Education	22.9	9.0	15.9	24.6	4.8	15.0	18.2	26.1	53.6	103.1	29.3
14	Restaurants and hotels	107.4	102.4	131.5	166.0	189.5	225.5	257.7	292.5	429.4	508.4	241.0
15	Other goods and services	94.6	90.7	128.6	168.9	177.6	209.3	243.7	263.0	332.1	423.2	213.2
98	Durable goods	36.5	45.0	57.8	77.1	89.3	127.6	121.8	153.6	199.1	224.5	113.2

Source: authors' calculations based on HBS, 2012

Table 2.3 Structure of Mean (unequalised) household expenditure by income decile and expenditure category, %, HBS (2012)

Category	Label	Income decile group										All
		1	2	3	4	5	6	7	8	9	10	
1	Food and non-alcoholic beverages	17.17	18.98	17.02	16.21	15.11	14.64	14.05	12.62	11.57	9.28	13.64
2	Alcoholic beverages	1.72	1.84	1.58	1.50	1.89	1.85	2.07	1.97	1.95	1.95	1.87
3	Tobacco	2.47	1.93	1.68	1.41	1.40	1.41	1.11	0.88	0.75	0.35	1.13
4	Clothing and footwear	5.24	5.60	5.03	5.35	5.48	5.32	5.74	5.95	5.64	6.11	5.63
5	Home fuels, electricity and water	10.63	10.77	9.56	8.67	7.91	7.67	7.10	6.87	5.85	5.04	7.34
6	Housing and rents	17.10	12.61	14.14	13.87	14.35	13.25	11.61	12.34	12.15	12.45	13.04
7	Household goods and services	1.45	1.59	1.72	1.36	1.56	1.35	1.23	1.17	1.32	1.24	1.35
8	Health	0.87	1.27	1.17	1.03	1.38	1.89	1.29	1.19	1.38	2.56	1.53
9	Private transport	5.86	7.34	7.81	7.69	8.91	9.07	10.06	9.75	9.71	8.29	8.73
10	Public Transport	2.18	1.86	1.31	1.47	1.06	1.40	1.38	1.67	1.98	2.01	1.66
11	Communication	3.76	4.26	4.06	3.61	3.47	3.64	3.35	3.42	2.87	2.47	3.31
12	Recreation and culture	9.37	11.29	12.86	13.16	13.08	13.53	15.08	14.41	14.84	15.70	13.91
13	Education	2.26	0.92	1.27	1.69	0.32	0.83	0.91	1.25	1.97	3.24	1.63
14	Restaurants and hotels	10.59	10.47	10.50	11.39	12.43	12.52	12.86	13.97	15.80	15.99	13.37
15	Other goods and services	9.33	9.28	10.27	11.59	11.65	11.62	12.16	12.56	12.22	13.31	11.83
98	Durable goods	3.48	4.40	4.41	5.02	5.53	6.62	5.73	6.84	6.83	6.59	5.91

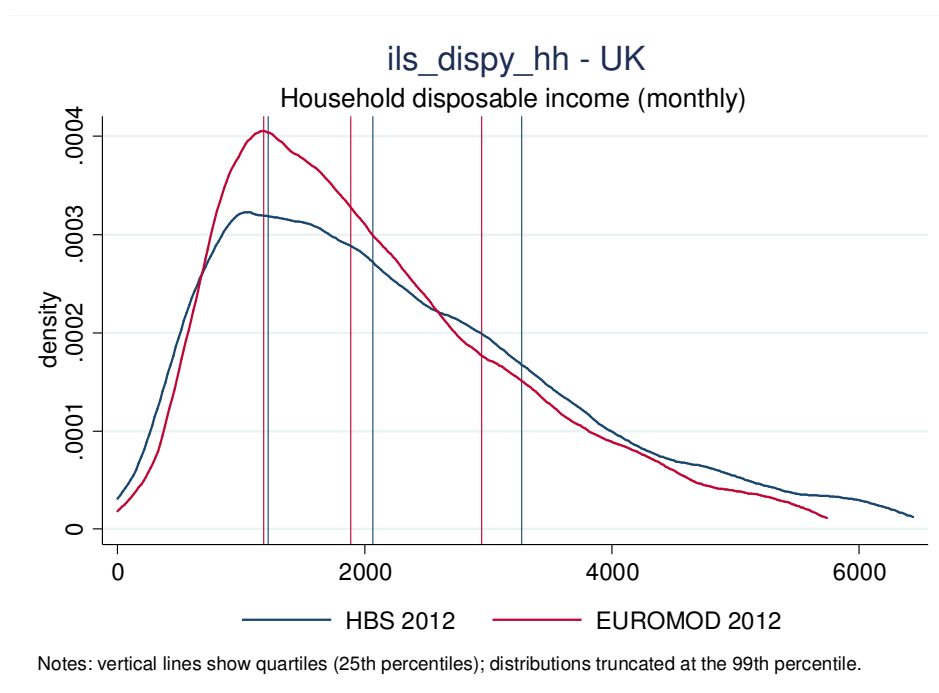
Source: authors' calculations based on HBS, 2012

Table 2.2 reports HBS unequivalised mean household disposable income, total expenditure and details on expenditures on durables and non-durables (for each of the 15 expenditure category) by income decile as observed from HBS. In the UK, on average the highest monthly spending are on recreation and culture, food and non-alcoholic beverages, restaurants and hotels, and housing and rents. The lowest spending are recorded on alcohol and tobacco and education, although we know that the first two categories are likely to suffer from some underreporting. When looking at how spending patterns change by income distribution, it is clear that share of expenditure on food and non-alcoholic beverages declines with income, as well as the share of expenditure on tobacco, home fuels, electricity and water and housing and rents (Table 2.3). On the other hand, the share of expenditure on private transport and restaurant, hotels and holidays in the first decile is almost half that of the top decile groups.

2.3 Comparison of variable distributions in HBS and EUROMOD input data

This section reports descriptive statistics on the factors that affect households' decisions on the allocation of their expenditures. To get unbiased imputations of household expenditure in SILC data, it is crucial that control variables - used in regressions that are run on HBS data - have similar distributions in EM-FRS. This subsection gives an overview of the comparability of UK HBS and the EUROMOD input data for the United Kingdom.

Figure 2.1 Household disposable income, HBS vs FRS



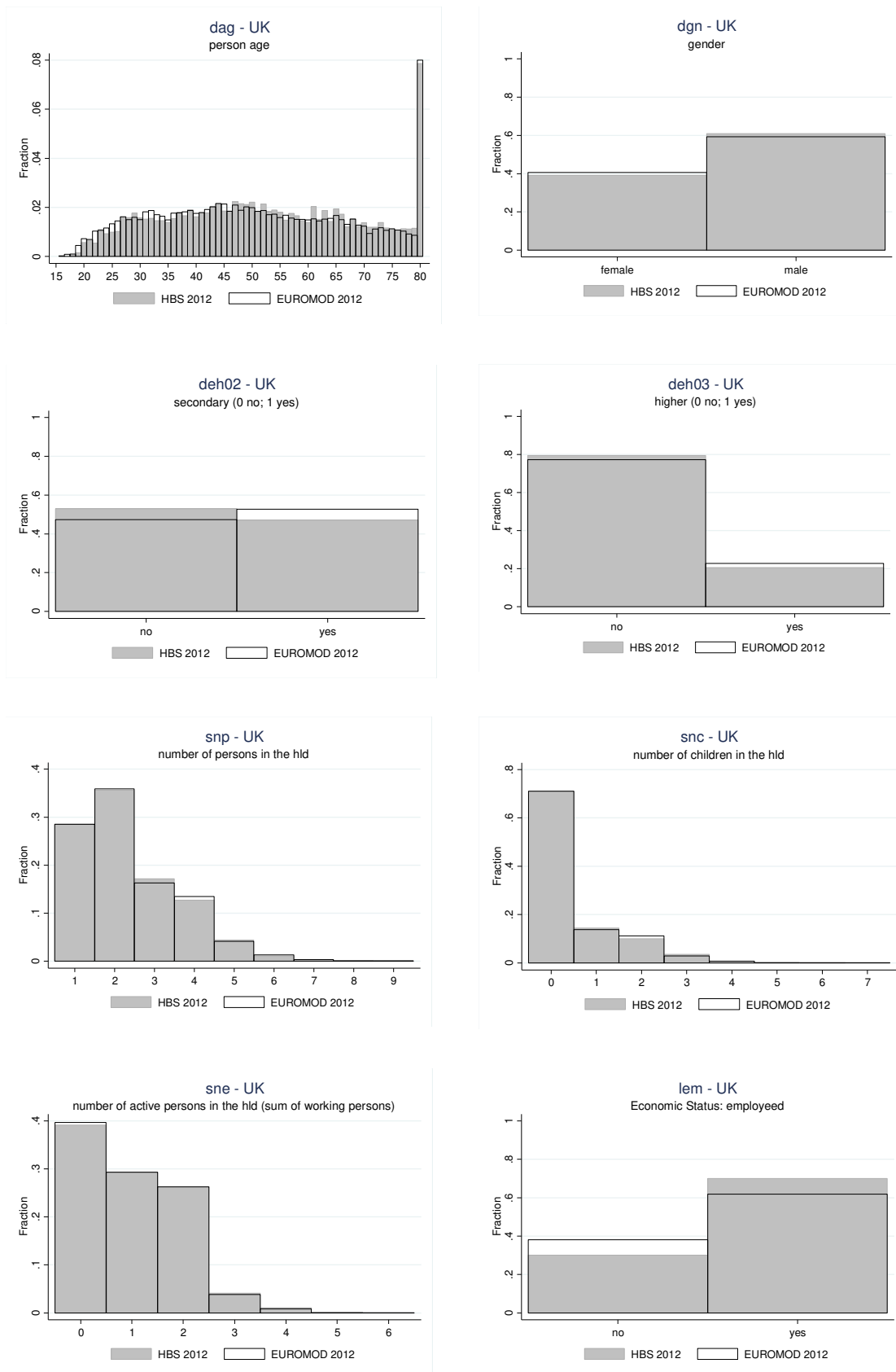
Source: authors' calculations based on EUROMOD-FRS and HBS, 2012

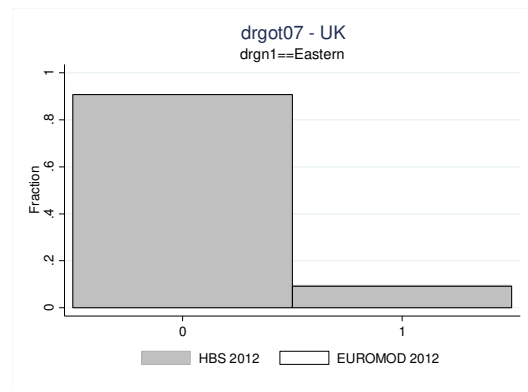
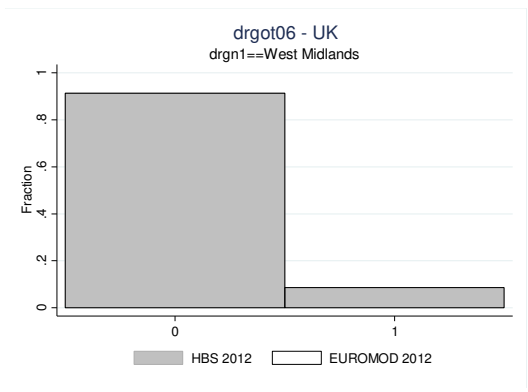
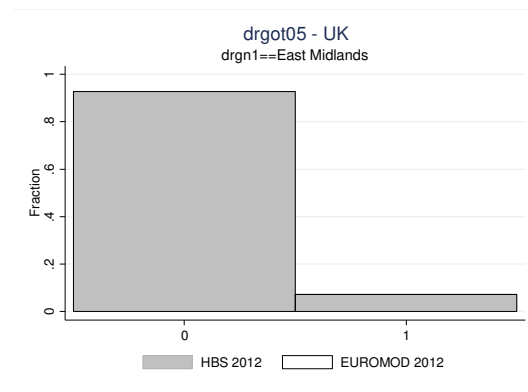
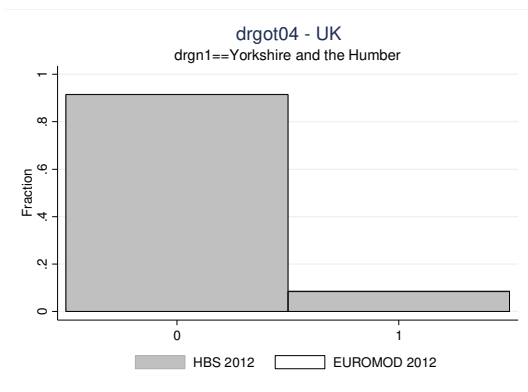
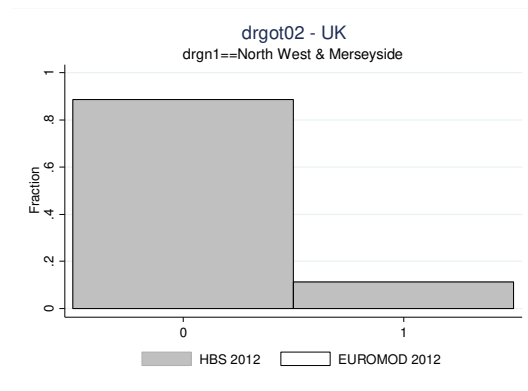
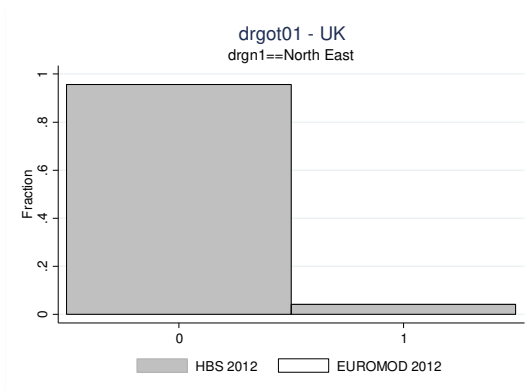
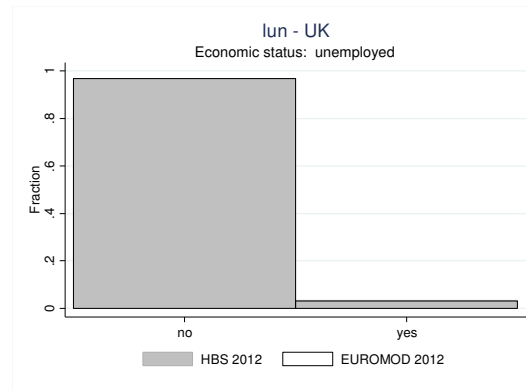
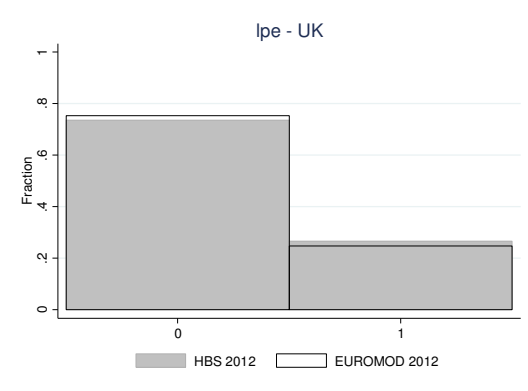
Figure 2.1 shows that household disposable income follows a very similar pattern in HBS and EUROMOD/SILC data. While FRS data⁵ has slightly higher density of incomes around the 25th

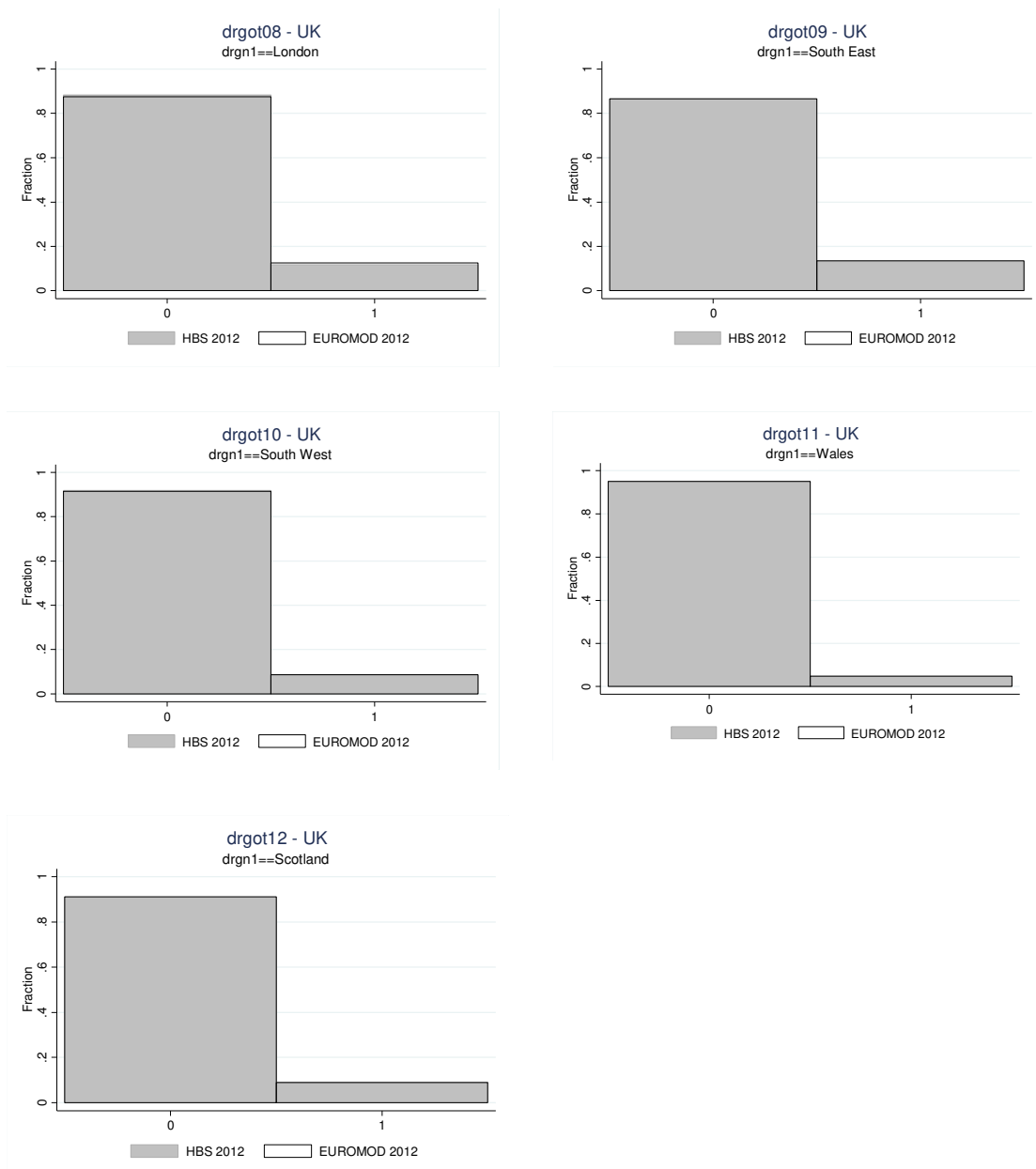
⁵ From hereafter the term FRS data is used to indicate the EUROMOD input data that is based on the FRS data.

percentile, the overall differences are quite small and the match between the two datasets can be considered to be good.

Figure 2.2 Distribution of selected covariates in HBS (2012) and EUROMOD (2012 simulation)







Source: authors' calculations based on EUROMOD-FRS and HBS, 2012

In general, other variables used for imputing expenditures between HBS and EUROMOD-FRS match well (see Figure 2.2). Small differences can be noticed in coding of variable secondary education (*deh02*) and employment status (*lem*). However, the differences are so small that should not mislead imputation of expenditures.

3. VALIDATION OF ESTIMATED DEMAND SYSTEM AND EXPENDITURES IMPUTED INTO EUROMOD

Next we look at how actual and imputed expenditure data compares across sources.

Table 3.1 shows mean levels of total expenditure categories observed and predicted in HBS (2012), expenditures imputed in EUROMOD and national accounts aggregates. Figure 3.3 and Figure 3.2 compares observed and predicted HBS aggregated expenditures with expenditures imputed into EUROMOD-FRS and figures provided by the OECD (national accounts). Total expenditure captured by the HBS makes up to 71% of what we see from the OECD data. The lowest coverage is achieved by expenditure on public transports and tobacco, which represent respectively 24% and 34.6% of OECD aggregate values.

Table 3.1 Total annual expenditure by category: HBS 2012 (observed and predicted), EUROMOD (2012 system simulation) and OECD national account statistics (2012), mIn GBP

Category	Observed in	Predicted in	Imputed in	OECD
	HBS	HBS	EUROMOD	aggregate
Food and non-alcoholic beverages	77,780.09	81,666.73	83,401.79	91,263
Alcoholic beverages	10,672.67	11,872.5	12,945.93	16,975
Tobacco	6,470.66	7,012.98	8,170.6	18,698
Clothing and footwear	32,127.34	32,236.22	36,863.3	55,835
Home fuels, electricity and water	41,854.53	47,192.91	48,067.79	42,175
Housing and rents	74,356.16	72,531.65	78,375.34	57,877
Household goods and services	7,723.82	7,732.6	8,196.1	10,333
Health	8,729.34	8,605.21	8,834.04	17,854
Private transport	49,781.91	51,374.41	58,013	64,583
Public Transport	9,485.86	9,469.64	11,651.46	39,325
Communication	18,891.69	19,938.68	19,856.28	19,858
Recreation and culture	79,337.98	78,250.05	81,629.02	75,771
Education	9,275.5	9,110.7	6,960.42	15,783
Restaurants and hotels	76,262.34	75,024.87	82,891.48	97,017
Other goods and services	67,451.08	66,969.36	73,627.48	128,089
Durable goods	35,824.75	37,186.42	61,497.39	102,077
Total non-durables	570,201	578,988.5	619,484	751,436
Total expenditures	606,025.75	616,174.94	680,981.44	853,513

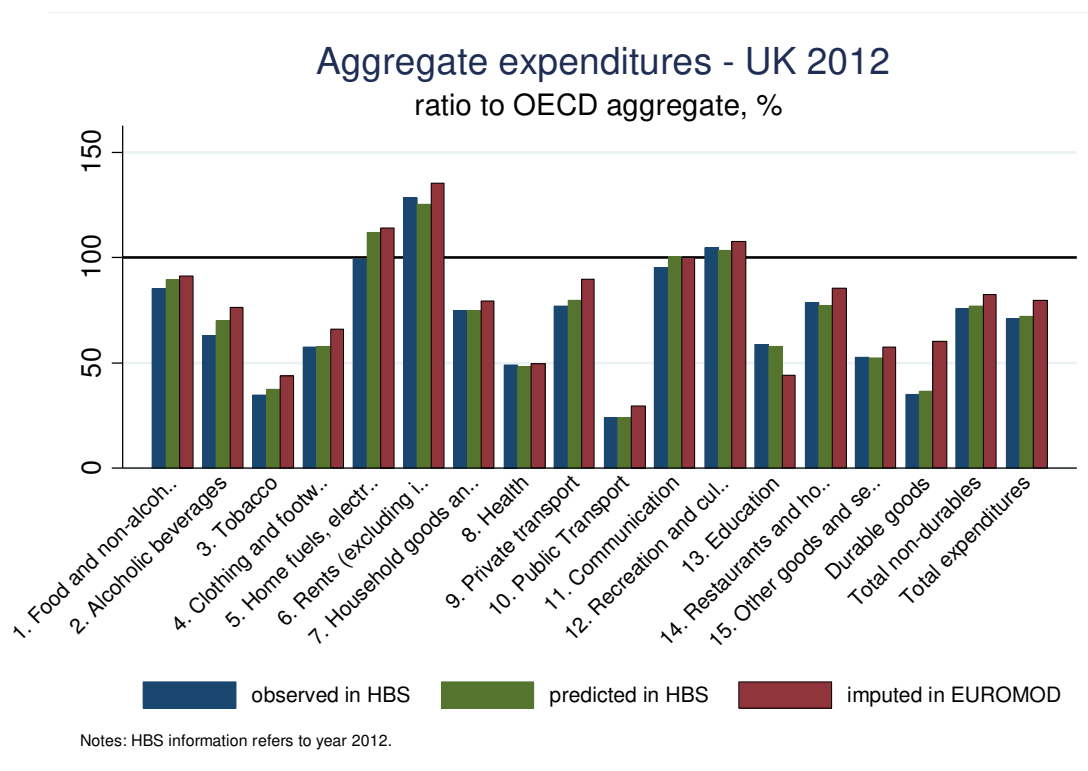
Source: authors' calculations based on EUROMOD G4.1, HBS 2012 and OECD

The match between actual and predicted HBS expenditures is very good with small overestimation of expenditures on food and non-alcoholic drinks, alcohol, tobacco, home fuels and electricity, private transport, communication and durables. Imputation into EUROMOD-FRS matches quite closely the predicted HBS expenditures data. Total imputed aggregated expenditure covers almost 80% of OECD aggregated expenditure from National Accounts. The most important differences affect public transport (29.6%), tobacco (43.7%), health (49.5%) and education (44.1%) as for the HBS. Some underestimations are observable also on spending for clothing and footwear (66%), household goods and services (79.3%), restaurant and hotels (85.4%). Overestimations are observable for home fuels, electricity and water (114%), housing and rents (135.4%), recreation and culture (107.7%).

Table 3.2 Overview of HBS actual and EUROMOD imputed expenditure

	HBS		EUROMOD	
	Expenditure, mln GBP	% to OECD expenditure	Expenditure, mln GBP	% to OECD expenditure
Food and non-alcoholic beverages	77,780	85.2%	83,402	91.4%
Alcoholic beverages	10,673	62.9%	12,946	76.3%
Tobacco	6,471	34.6%	8,171	43.7%
Clothing and footwear	32,127	57.5%	36,863	66.0%
Home fuels, electricity and water	41,855	99.2%	48,068	114.0%
Housing and rents	74,356	128.5%	78,375	135.4%
Household goods and services	7,724	74.7%	8,196	79.3%
Health	8,729	48.9%	8,834	49.5%
Private transport	49,782	77.1%	58,013	89.8%
Public transport	9,486	24.1%	11,651	29.6%
Communication	18,892	95.1%	19,856	100.0%
Recreation and culture	79,338	104.7%	81,629	107.7%
Education	9,276	58.8%	6,960	44.1%
Restaurants and hotels	76,262	78.6%	82,891	85.4%
Other goods and services	67,451	52.7%	73,627	57.5%
Durables	35,825	35.1%	61,497	60.2%
Total	606,026	71.0%	680,981	79.8%

Source: authors' calculations based on EUROMOD G4.1, HBS 2012 and OECD

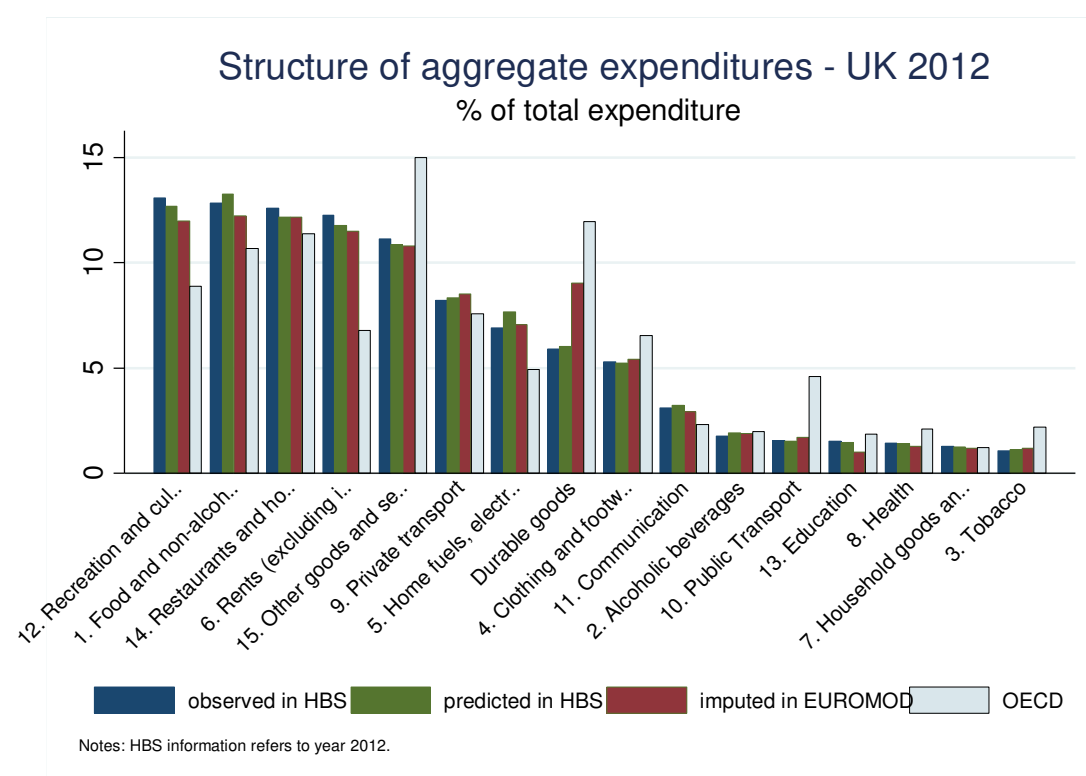
Figure 3.1 Aggregate observed and imputed expenditures.

Source: authors' calculations based on EUROMOD G4.1, HBS 2012 and OECD

Figure 3.2 shows the structure of aggregate expenditures in the UK ordering the 16 expenditure categories considered in this report from the largest to the smallest (share of total expenditure).

The most important expenditure categories are recreation and culture, food and non-alcoholic beverages and restaurants and hotels. Each of these categories makes up slightly over 12% of total expenditures in HBS, while in EUROMOD they take between 11%-12% of total expenditures. Durables make up around 6% in HBS, 9% in EUROMOD, but 12% of total expenditures for the OECD figures.

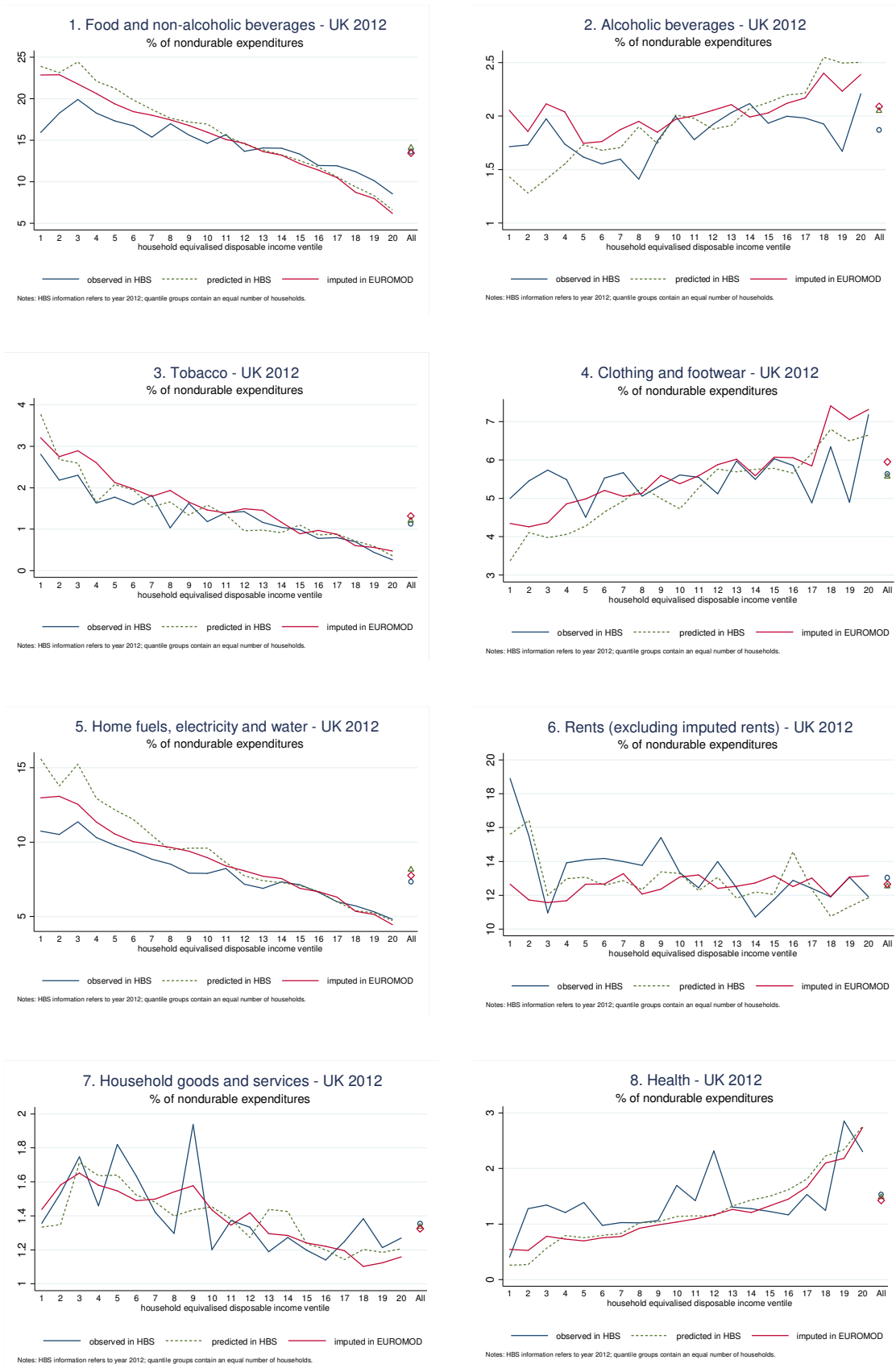
Figure 3.2 Structure of aggregate expenditures.

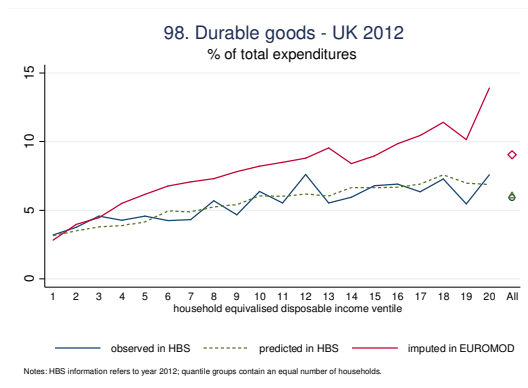
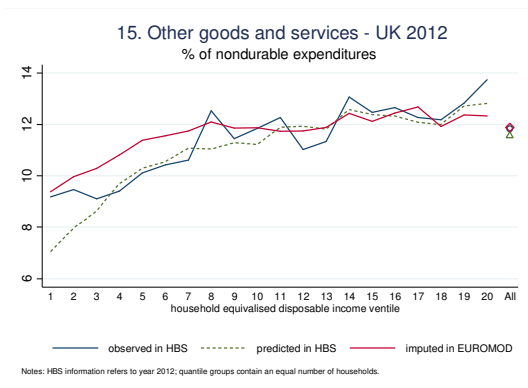
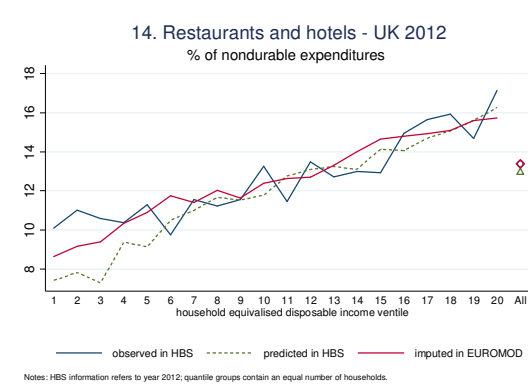
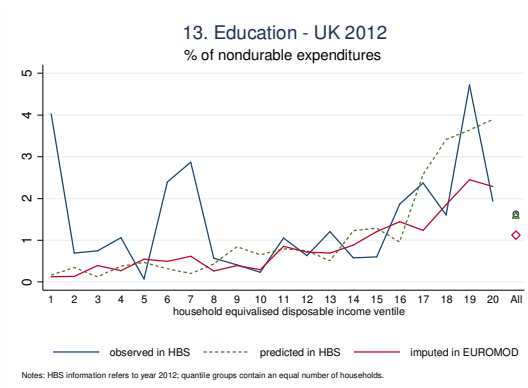
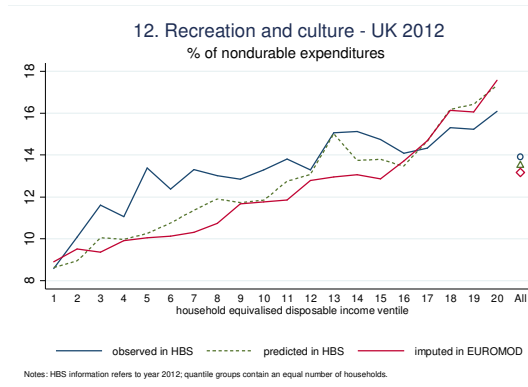
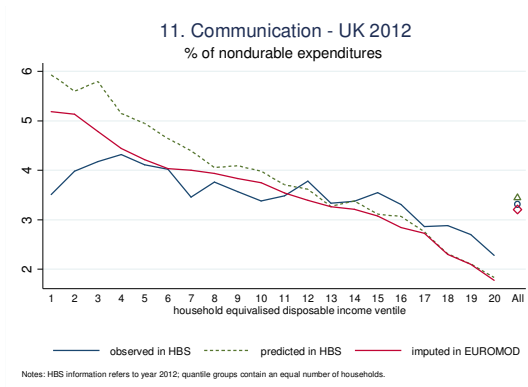
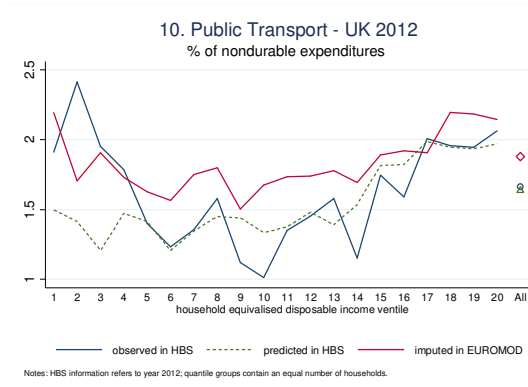
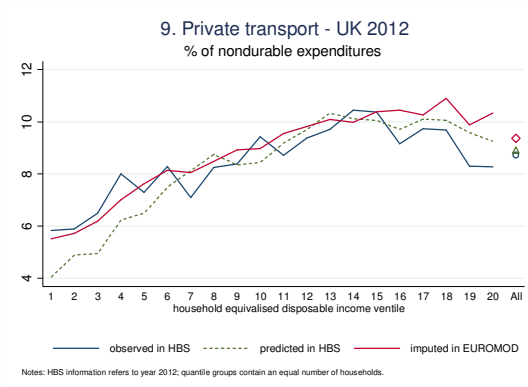


Source: authors' calculations based on EUROMOD G4.1, HBS 2012 and OECD

Figure 3.3 assesses the quality of estimation comparing the distribution of HBS in-sample prediction and EUROMOD-FRS imputed household share of expenditures per month with the distribution of average HBS observed share of expenditure for each of the 16 categories. The graphs show that in the UK the model is capturing well households' preferences and allocation of expenditures. Our in and out of sample predictions are very closed to the observed values in HBS. Some small differences are noticeable at the bottom of the income distribution for spending on food and non-alcoholic beverages, home fuel, electricity and water, housing and rents, public transport, communications and education; and at the top of the income distribution for durables. This confirms that the model used is doing well in approximating consumers demand in the UK and we can confidently proceed using it for simulating indirect taxation into EUROMOD.

Figure 3.3 Share of expenditures by vintiles of household equivalised disposable income, HBS vs EUROMOD-FRS (2012)





Notes: non-durable expenditure categories shown as a share of total non-durable expenditures and durable expenditures as a share of total expenditures; ventiles are constructed on the basis of household disposable income equivalised with the modified OECD scale, allocating the same number of households to each ventile.

Source: authors' calculations based on EUROMOD G4.1 and HBS 2012

4. VALIDATION OF INDIRECT TAX SIMULATIONS IN EUROMOD

In this section we compare the simulated indirect taxes with external data on tax revenues in 2011-2016 and analyse tax incidence across UK households in 2012.

Table 4.1 reports actual tax revenues from VAT and excise taxes between 2011-2015 and the simulated amounts of taxes in 2011-2016 by EUROMOD. It should be noted that the external data on tax revenues include revenues derived from consumption by non-domestic households (e.g. foreign tourists, cross-border shopping), which we do not capture in our tax simulations, and therefore we unavoidably undersimulate the tax revenues. We also do not capture the VAT that is paid by companies but not passed to final consumers. In 2012 we simulate 65% of the actual total VAT revenues in the UK. The ratio of simulated excise tax to the actual revenues is lower and amounts to 40%, of which the ratio for the excise tax on alcohol is 33%, the ratio of excise tax on tobacco consumption is 47%, the ratio on excise tax on private transport is 65%, the ratio on excise tax on betting games is 35% and the ratio to actual excise tax on insurance premiums is 54%.

There are several likely reasons for underestimation of the excise tax on alcohol, tobacco and betting games, apart from consumption by non-domestic households. First, with respect to alcohol, HBS does not distinguish alcohol consumed outdoors – respondents just record the total amount spent on outdoor meals. Second, expenditures on “sin goods” such as alcohol, tobacco, betting games or junk food are strongly underreported in HBS data (as shown by Table 3.1). This suggests that undersimulation of excise tax on these goods is to a large extent due to a small share of actual consumption of these goods that is captured by HBS.

Household expenditures for other years are simulated in real terms, i.e. on the basis of incomes backrated/uprated to 2012. To obtain nominal expenditures and calculate indirect taxes for a given year, simulated real expenditures are then uprated with the same index. The index is based on actual year-on-year nominal growth of household consumption in 2011-2015⁶ and forecasted nominal growth of GDP in 2016⁷(see in Table 6.1 Appendix).

The ratio of simulated VAT revenues to the actual revenues from VAT from household sector is 63% in 2013, 62% in 2014 and 61% in 2015.

The ratio of simulated revenues from excise tax to the actual revenues slowly improves over time increasing from 38% in 2011 to 47% in 2015. This is mainly driven by improve capturing of excises from private transports which increase from 63% in 2011 to 85% in 2015, while the ratio between simulated and actual excises from alcohol and tobacco remains relatively constant over the period, simulated excises on betting games do not capture the increase of spending observed from National Accounts.

⁶ OECD data on final consumption expenditure of households.

⁷ OBR, Economic and Fiscal outlook 23 November 2016,

<http://budgetresponsibility.org.uk/efo/economic-and-fiscal-outlook-november-2016/>

Table 4.1 Total indirect tax by type (excises, VAT, total indirect taxes), mln GBP and ratio, 2011-2016: actual and simulated

	Simulated by EUROMOD						National Accounts					Ratio EM/ext				
	2011	2012	2013	2014	2015	2016	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
General Government total revenue	89,575	94,559	96,694	101,638	106,404	110,380	472,315	473,777	493,646	515,348	533,686	0.19	0.20	0.20	0.20	0.20
VAT	61,514	65,131	66,230	69,271	70,977	73,075	98,292	100,572	104,718	111,363	115,415	0.63	0.65	0.63	0.62	0.61
- household sector	61,514	65,131	66,230	69,271	70,977	73,075	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
- business sector	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Excises	28,061	29,428	30,464	32,368	35,427	37,305	73,312	74,038	74,987	75,378	75,867	0.38	0.40	0.41	0.43	0.47
- alcohol	3,076	3,371	3,529	3,470	3,460	3,658	10,036	10,219	10,455	10,489	10,686	0.31	0.33	0.34	0.33	0.32
- tobacco	4,610	4,540	4,880	4,938	4,749	4,883	9,551	9,681	9,531	9,548	9,485	0.48	0.47	0.51	0.52	0.50
Private transports	16,315	17,106	17,557	22,566	22,566	23,885	26,045	26,229	26,451	26,613	26,515	0.63	0.65	0.66	0.85	0.85
-Betting games/ recreation and culture	552	583	595	624	592	612	1,633	1,680	2,098	2,116	2,666	0.34	0.35	0.28	0.29	0.22
- restaurant and hotel	1,972	2,200	2,244	2,249	2,280	2,430	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
- insurance premium tax (other goods and services)	1,536	1,626	1,660	1,737	1,780	1,838	2,941	3,021	3,014	2,965	3,293	0.52	0.54	0.55	0.59	0.54

Notes: 2016 National Account values not available at the time of writing this report.

Source: authors' calculations based on EUROMOD G4.1 and <https://www.gov.uk/government/statistics/hmrc-tax-and-nics-receipts-for-the-uk>

Table 4.2 shows simulated implicit indirect tax rate by product categories in 2011-2016. The categories that are subject to the highest implicit tax rates are tobacco (260%), alcohol (74%) and private transport (77%, due to the excise tax on fuel). In general, implicit tax rates do not decrease over time with two exceptions: implicit tax rate on tobacco products between 2011 and 2016 decrease from 302% to 223%; and implicit tax rates on alcoholic beverages from 2013 to 2016 decrease from 75% to 71%. As VAT rates and ad-valorem excises rates remain constant between 2011 and 2016 in the UK, the implicit tax rates are driven from the combine growth rates of consumer and excises prices⁸. When consumer prices q_k increase faster than specific excises prices, implicit tax rates decrease. In particular, this is the case for cigarettes, cigars and other tobacco products. Whilst the relative reduction of alcoholic beverages' implicit tax rate in 2013 is due to negative growth of specific excises prices of some alcoholic products such as spirits, ciders, alcopops and beer. In a similar manner, the relative reduction of alcohol's consumer prices in 2016 (compared to 2015) drives the implicit tax rate decrease observed in Table 4.2.

Table 4.2 Implicit indirect tax rate by expenditure category, %, 2011-2016

Label	2011	2012	2013	2014	2015	2016
Food and non-alcoholic beverages	2.36	2.36	2.36	2.36	2.36	2.36
Alcoholic beverages	70.66	74.54	74.95	71.51	69.79	71.52
Tobacco	301.94	260.14	285.75	268.29	226.32	222.74
Clothing and footwear	16.08	16.08	16.08	16.08	16.08	16.08
Home fuels, electricity and water	3.68	3.68	3.68	3.68	3.68	3.68
Housing and rents	0.52	0.52	0.52	0.52	0.52	0.52
Household goods and services	20.00	20.00	20.00	20.00	20.00	20.00
Health	4.08	4.08	4.08	4.08	4.08	4.08
Private transport	78.02	76.66	77.36	82.61	98.86	102.85
Public Transport	3.29	3.29	3.29	3.29	3.29	3.29
Communication	18.88	18.88	18.88	18.88	18.88	18.88
Recreation and culture	14.08	14.08	14.08	14.08	14.00	14.00
Education	0.00	0.00	0.00	0.00	0.00	0.00
Restaurants and hotels	22.15	22.34	22.34	22.18	22.14	22.26
Other goods and services	13.99	13.99	13.99	13.99	13.99	13.99
Durable goods	17.87	17.87	17.87	17.87	17.87	17.87

Source: authors' calculations based on EUROMOD G4.1

Table 4.3 and Table 4.4 present simulations of indirect taxes for the baseline tax year (i.e. legislation in place in 2012). They show mean (unequalised) household disposable income, total expenditure and total indirect taxes respectively by income decile and by expenditure decile. The amount of indirect taxes paid by each decile rises with income, reflecting the rising

⁸ The average implicit tax rate can be decomposed into three different indirect tax components:

$$\frac{\tau_k}{1 + \tau_k} = \frac{t_k}{1 + t_k} + \frac{a_k}{q_k} + v_k$$

From this we can see that when consumer prices q_k increase faster than specific excises prices, implicit tax rate decreases.

share in total consumption: the share of indirect taxes paid by top decile is more than five times (5.16) as high as the share of taxes paid by the bottom decile. However, the second part of Table 4.3 shows that indirect taxes are clearly regressive: tax liability in percent of disposable income declines about linearly from 17.76% in the first decile to 12.75% in the top decile of equivalised household disposable income. This is reflected mainly by VAT which in percentage of income is 11.72% in the first decile as opposed to 9.10% in the top decile. The variation of incidence of excise tax is smaller but still significant ranging between 6.04% and 3.65%. These effects are also visualized graphically by the solid line in Figure 4.1.

Table 4.4 and Figure 4.2 (dash line) show similar results but ranking households by equivalised total household expenditure. Also in this case indirect taxes increase with expenditure in nominal terms, but the share of indirect taxes on total expenditures paid by top decile (14.9%) is now higher than the share of indirect taxes paid by the bottom decile (10.95%), revealing that indirect taxes are progressive with respect to expenditure.

Figure 4.1 and Figure 4.2 also show shares of indirect taxes on total household expenditure by income decile (dash line in Figure 4.1) and shares of indirect taxes on total household income by expenditure decile (solid line in Figure 4.2). Figure 4.1 highlights that as income increases, indirect taxes also increase with total expenditures. Figure 4.2 shows that the proportion of indirect taxes over total household expenditure increases linearly up to the 9th decile, while it increases more than proportionally for the top decile. This is due to the reallocation of households between income and expenditure distributions: high expenditure-low income households belonging to the top expenditure decile show high indirect tax-income ratio mainly driven by VAT incidence as shown from the second panel of Figure 4.2.

Table 4.3 Mean (unequalised) household disposable income, total expenditure and total indirect taxes by income decile, 2012.

	Household Income	Household Expenditure	Indirect taxes	Incidence (% of income)				Total Indirect taxes
				VAT	Excises	Excises specific	Excises ad valorem	
1	637.08	922.09	113.17	11.72	6.04	5.06	0.98	17.76
2	1108.25	1210.02	155.59	9.29	4.75	4.03	0.72	14.04
3	1403.04	1473.76	192.73	9.27	4.47	3.86	0.61	13.74
4	1576.58	1591.27	211.64	9.09	4.33	3.77	0.57	13.42
5	1780.54	1746.70	236.46	9.07	4.21	3.70	0.51	13.28
6	2115.66	2026.81	281.47	9.04	4.26	3.78	0.48	13.30
7	2445.09	2254.05	319.02	8.90	4.15	3.69	0.46	13.05
8	2920.87	2611.13	371.55	8.76	3.96	3.56	0.40	12.72
9	3586.07	3270.28	474.21	9.23	3.99	3.60	0.39	13.22
10	4578.62	4063.72	583.76	9.10	3.65	3.29	0.36	12.75

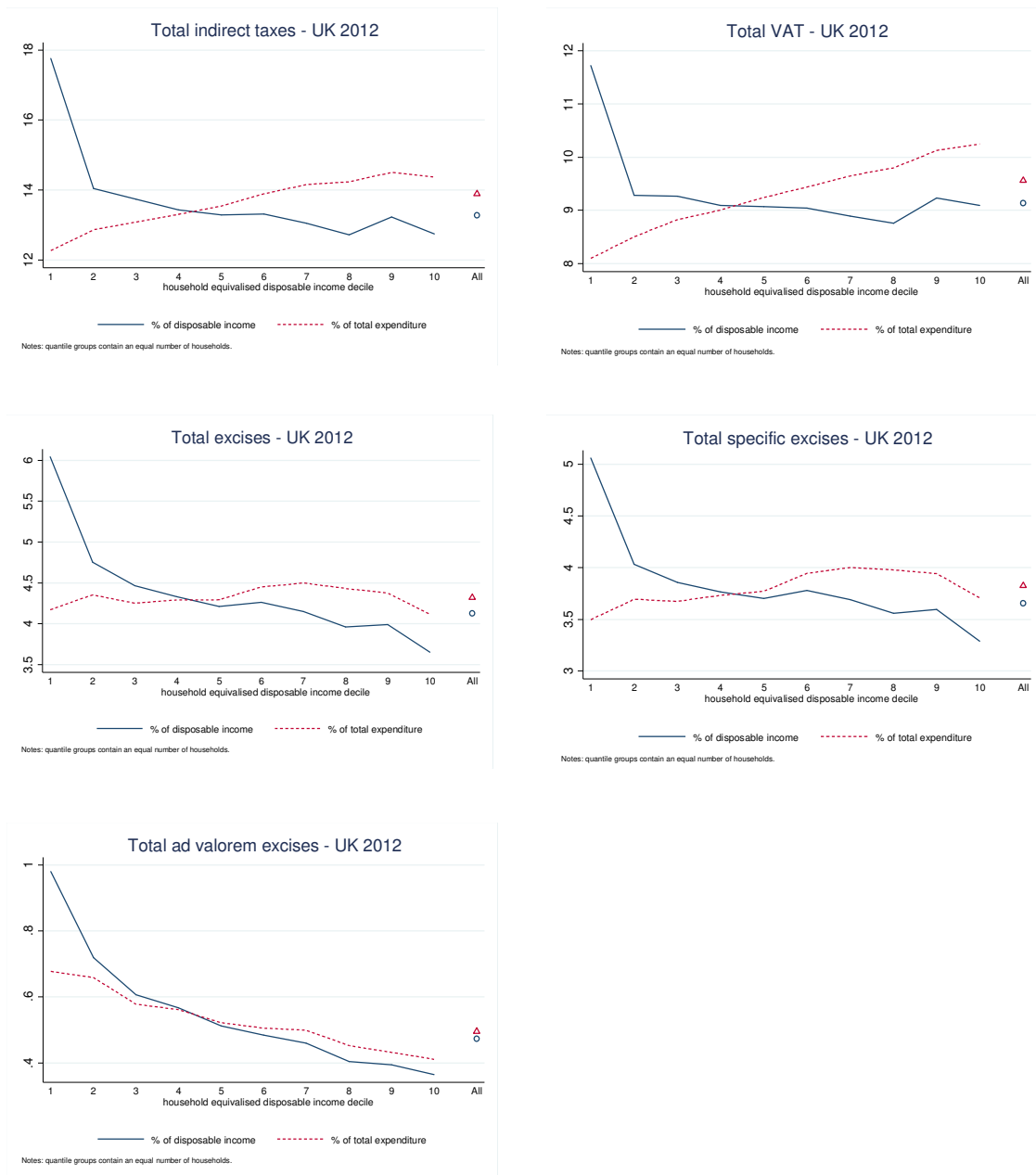
Source: authors' calculations based on EUROMOD G4.1

Table 4.4 Mean (unequalised) household disposable income, total expenditure and total indirect taxes by expenditure decile, 2012.

	Household Income	Household Expenditure	Indirect taxes	Incidence (% of expenditure)				Total indirect taxes
				VAT	Excises	Excises specific	Excises ad valorem	
1	646.69	637.69	69.80	7.39	3.56	2.84	0.72	10.95
2	1031.22	1003.84	119.77	8.17	3.76	3.13	0.63	11.93
3	1277.34	1254.36	157.12	8.45	4.08	3.47	0.61	12.53
4	1561.19	1582.15	207.51	8.82	4.30	3.73	0.56	13.12
5	1885.27	1879.81	255.67	9.13	4.47	3.94	0.54	13.60
6	2170.48	2078.37	287.57	9.34	4.50	3.98	0.51	13.84
7	2512.14	2283.83	322.89	9.51	4.63	4.11	0.51	14.14
8	2928.20	2572.77	363.53	9.64	4.49	4.02	0.47	14.13
9	3452.97	2909.88	415.51	9.84	4.43	3.98	0.46	14.28
10	4686.47	4967.81	740.33	10.73	4.18	3.78	0.40	14.90

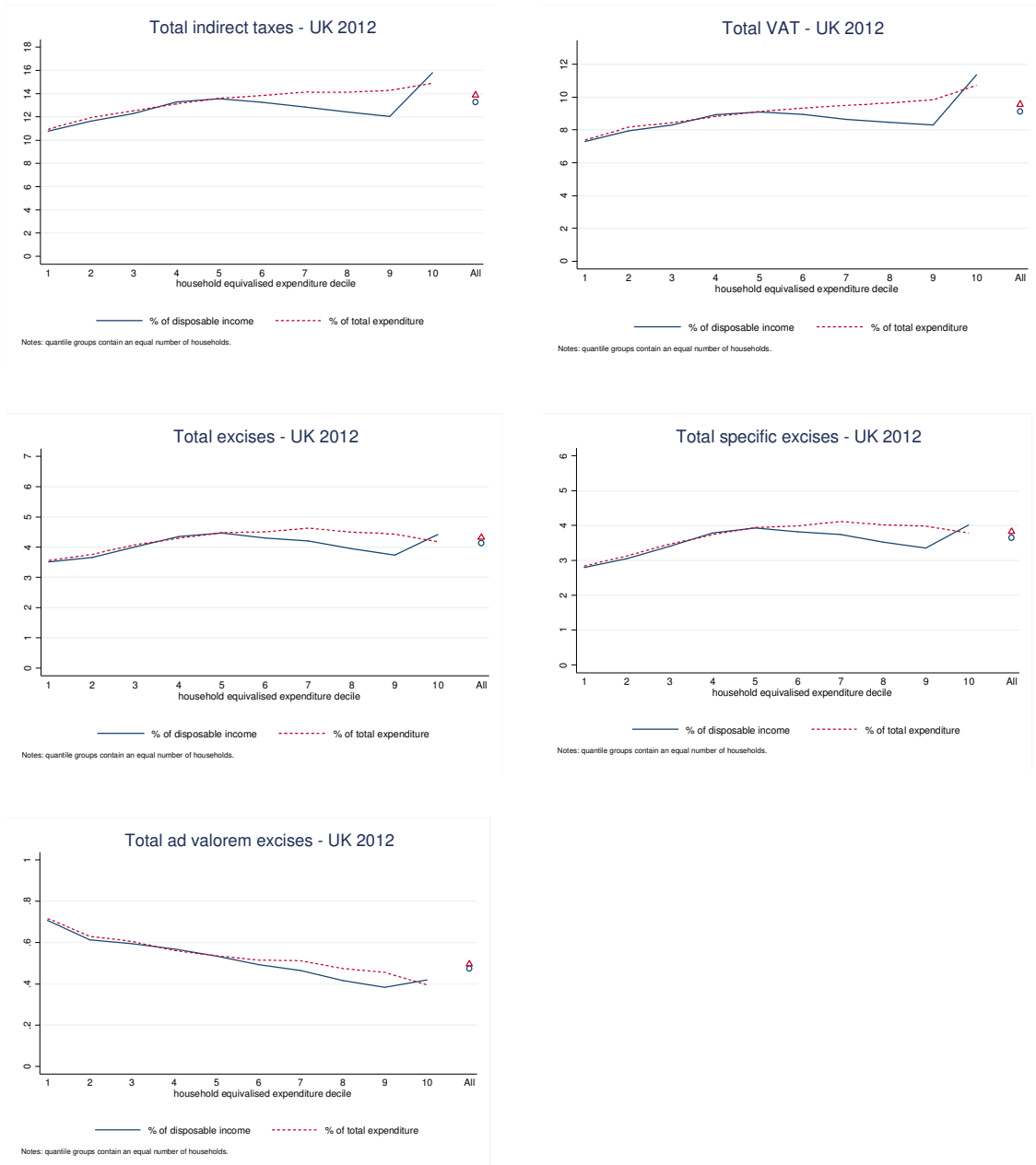
Source: authors' calculations based on EUROMOD G4.1

Figure 4.1 Incidence of indirect taxes by income decile, % of disposable income and expenditure, 2012



Source: authors' calculations based on EUROMOD G4.1

Figure 4.2 Incidence of indirect taxes by expenditure decile, % of disposable income and expenditure, 2012



Source: authors' calculations based on EUROMOD G4.1

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Useful websites

www.hmrc.gov.uk

<https://www.gov.uk/>

https://ec.europa.eu/taxation_customs

6. APPENDIX**Table 6.1 Uprating index used for calculation of nominal expenditures in 2011-2016**

	2011	2012	2013	2014	2015	2016
Index (2011 = 1)	1	1.043	1.088	1.131	1.161	1.204

Note: in 2011-2015, the index is based on actual year-on-year nominal growth of household consumption; in 2016, the index is based on forecasted growth of nominal GDP.

Source: OECD, OBR and authors' calculations.

