National Food Strategy

Supplementary Evidence, January 2020

BAIN & Company

Diagnosis: point of departure

Our Food System Today

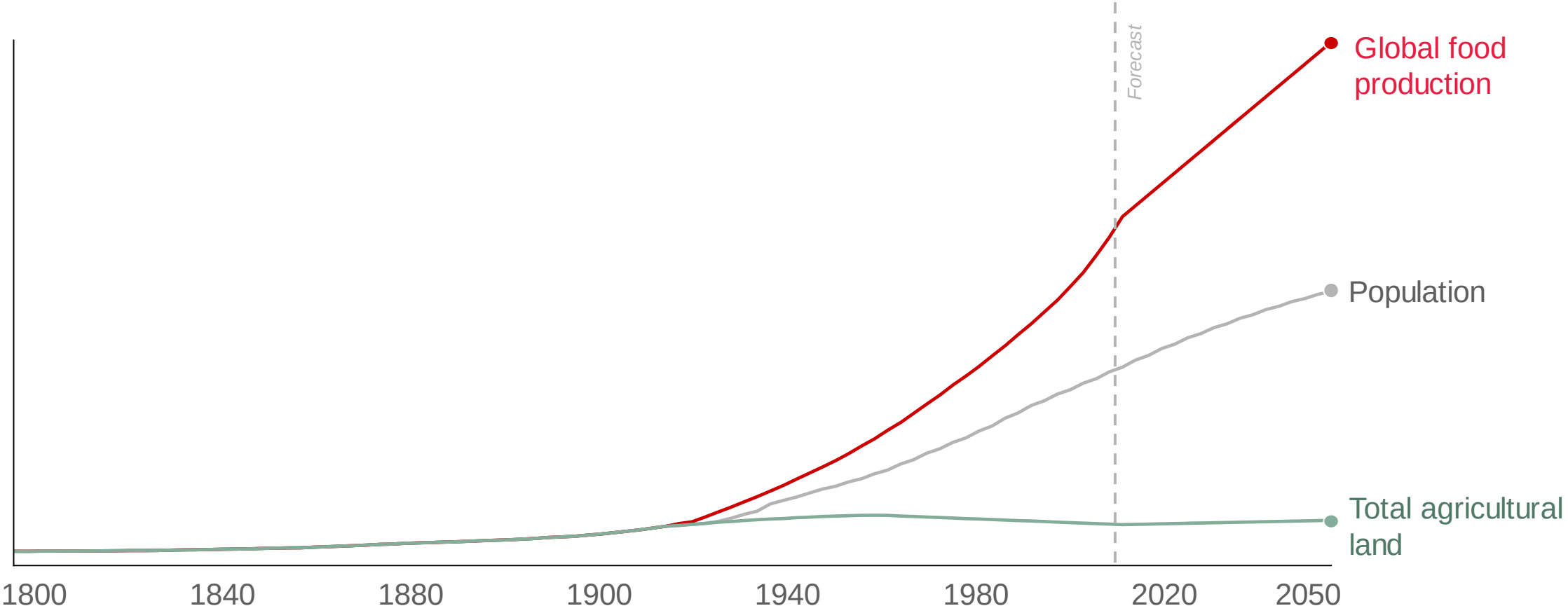
Climate, nature and land

Diets and health

Inequality

Global food production is expected to grow fast enough to feed the global population

ANALYSIS COURTESY OF OECD FCAN



Note: 1800 to 2010 Analysis courtesy of OECD Food Chain Analysis Network; 1950=100
Source: 1800 to 2010 source: Population data from Maddison's historical statistics for 1820-1940; UN Population Division for 1950-2030; 1800 and 1810 extrapolated from Maddison. Agricultural (crops and pasture) land data for 1800-2010 from the History Database of the Global Environment (HYDE 3.2), Klein Goldewijk et al. (2017). Global agricultural production data for 1960-2010 from FAOSTAT (Net Agricultural Production Index); 2010 onwards sources based on forecasts from: Food production and agricultural land from The Future of food and agriculture: Alternative Pathways to 2050, FAO, 2018 (agriculture land based on arable land forecasts); Population data from Historical population data and projections, OECD (Accessed 12th Dec 2019)

The farming system in England has not historically focused on environmental sustainability

1947 – UK Agriculture Act

Objective: increase domestic production, encourage new farmers post-war

Key policy: guaranteed prices for key produce

Outcome: increased intensity of land use, extensive chemical input

Environmental impact

"But the lasting achievement of **post-war policy** has been the **changes it has wrought in the landscape and the natural environment… deleterious if not disastrous"**

J K Bowers, 1985

1980 – UK joins CAP (launched by EU in 1962)

Objective: support farmers, improve agricultural productivity

Key policies: income support / direct payments linked to production, rural development, market measures, agri-environment scheme (2000 onwards), reforms to single payment scheme (2005)

Outcome: over production, high expenditure, international trade frictions, supply controls

Environmental impact

"During the 1960s and 1970s, the CAP led to increased agricultural production in Europe … **by the 1980s negative environmental effects of increased production** (e.g. water pollution and soil impoverishment) **began to surface**"

Institute for Agriculture and Trade Policy, 2007

Pre-2013, environment objectives were **secondary to productivity and farmer support**

2013 – CAP Reform and Greening

Objective: strengthen competitiveness, promote sustainability and innovation

Key policies: greening payments for environmental practices, young farmer payments

Outcome: fails to deliver environmental outcomes, disproportionately supports large farms, undermines efficiency and growth

Environmental impact

"We found that greening is **unlikely to provide** significant **benefits for the environment** and climate"

European Court of Auditors, 2017

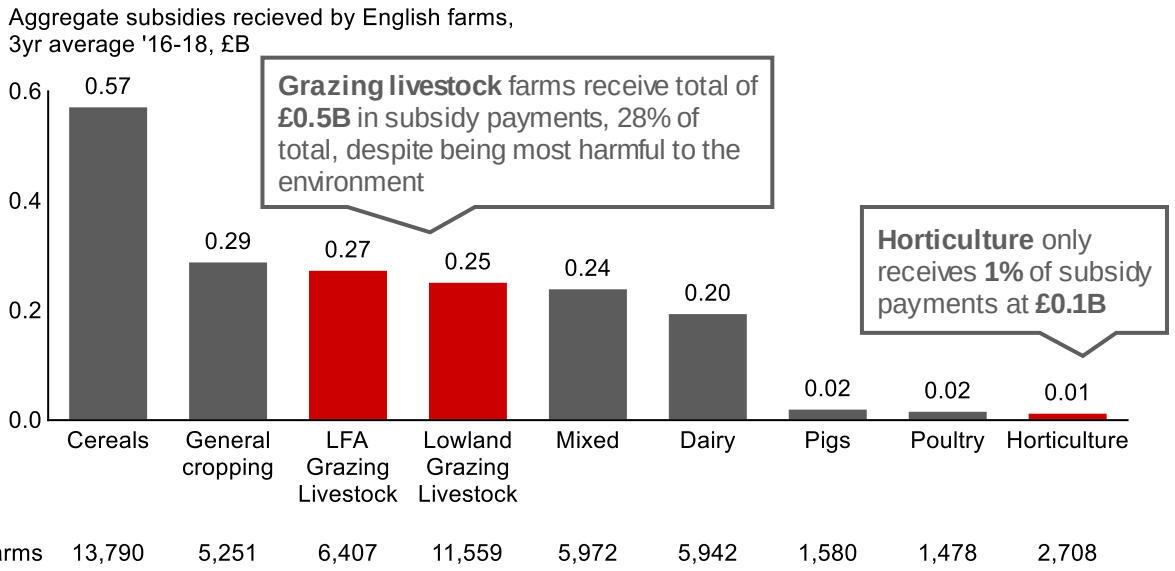
Note: CAP = Common Agricultural Policy

Source: European Commission; British Agricultural Policy Since the Second World War , J K Bowers, 1985; European Court of Auditors, 2017; The Future Farming and Environment Evidence Compendium, Defra, 2019; Aims of the common agricultural policy, Europa, 2019; Trade impacts of Agricultural support in the EU, IATRC, 2017

CAP has contributed to the inefficient use of land and overuse of environmentally unfriendly inputs

English farms received £1.8B in EU subsidies in 2017

- Direct Payments are **EU subsidies paid to farmers**
- A **total of £1.8B** was paid to English farms in 2017, through payments based on land (Basic Payment Scheme) and broad environmental requirements (Greening)



Defra review suggests subsidy scheme has been ineffective

"Most, but not all, farmers say change is needed in the industry and **direct payments have inhibited change**. Some farmers highlighted that costs have been higher as a result of direct payment support"

Defra, 2019

Undermines efficiency and productivity growth

- Payments on basis of land decreases farmer focus on optimising profitability from agricultural activity
- Exert upwards pressure on land prices and rents, preventing structural change

Disproportionally supports large farms

- 10% of claimants received half of the £1.8B subsidy payments, with 33% of farms receiving less than £5,000
- Farms must have at least 5 hectares of land to qualify - many small farms are ineligible

Fails to deliver positive **environmental outcomes**

- EU Court review of Greening payments concluded the scheme was "unlikely to significantly enhance environmental and climate performance"

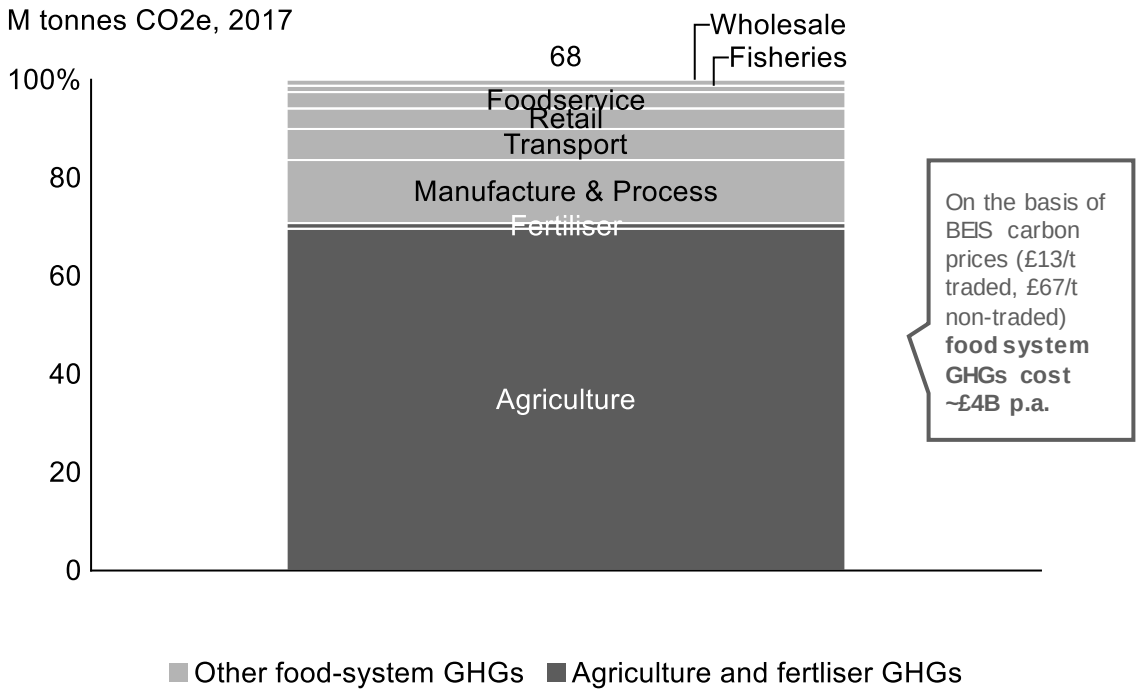
"Basic Payment Scheme is wrong – **propping up inefficiency**"
"**No-one owes us a living**"

UK Farmers, Defra interviews

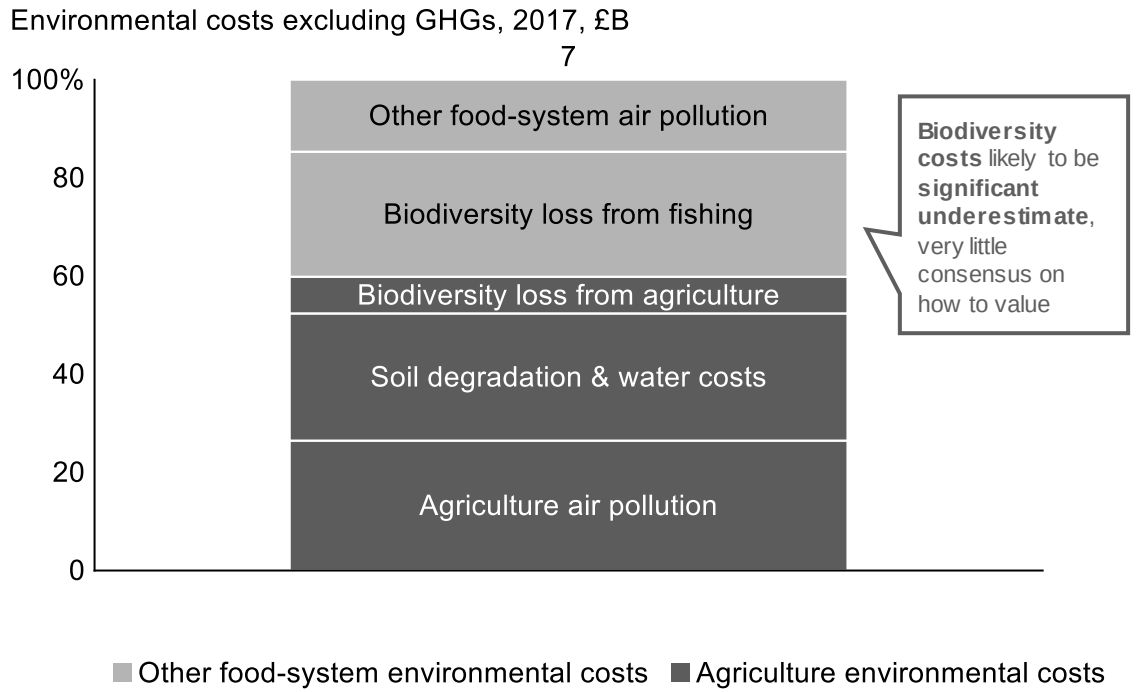
Note: Subsidies include payments from Basic Payment Scheme, agri-environment payments and other subsidies to agriculture
Source: The Future Farming and Environment Evidence Compendium, Defra, 2019; England Farm Business Survey, Defra, 2019

Environmental impact of UK food system is predominantly from agriculture

~70% of food-related GHGs come from agriculture and fertilisers; total GHG food-system cost of ~£4B p.a.



~60% of air and water pollution, soil degradation and biodiversity costs from agriculture; total cost ~£7B p.a.



Note: Does not cover international/ imported food production costs to the environment; GHG emissions allocated based on 2017 SIC codes emission figures for Agriculture, Manufacturing, Chemicals, Wholesale, Retail, Foodservice and Freight transport by road adjusted for % of market that food-related – Wholesale 12%, Retail 37%, Freight transport 34%, %s from ABS; National 2017 prices for air pollutants used; Soil Degradation costs for England and Wales only (Cranfield 2011 for Defra); Biodiversity costs proxied on basis of cost to implement biodiversity restoration and management; fertiliser shown as GHGe from fertiliser manufacture, fertiliser use included in Agriculture GHGe; Other food system air pollution includes pollution from food transportation and manufacturing; All prices shown in 2017 using ONS GDP deflator; full detail on calculations and assumptions in appendix; Source: Total greenhouse gas emissions by industry section and group, ONS, 2017; Valuation of energy use and greenhouse gas emissions for appraisal, BEIS, 2019; Emissions of Air Pollutants in the UK, Defra, 2019; Air Quality Cost guidance, Defra, 2019; Cost of soil degradation in England and Wales, Cranfield University, 2011; Annual Business Survey (ABS), ONS, 2017; Biodiversity: Finance and the Economic and Business Case for Action, OECD, 2019; Environmental Accounts of Agriculture, Cranfield University on behalf of Defra, 2007; Costs of the UK Biodiversity Action Plan Update, GHK on behalf of Defra, 2010; Total fisheries production, World Bank, 2017; The Sunken Billions Revisited, World Bank, 2017; Pollinators, Pollination and Food production, IPBES, 2015; Status of pollinating insects indicator, Defra, 2017; GDP deflator, ONS, 2018

There are 2 main types of livestock finishing methods; feedlot finishing and pasture finishing

Feedlot is an intensive form of animal production

Definition

- Intensive form of animal production where livestock spend the last months before their slaughter in **an array of pens**, being fed concentrate[1] to achieve optimal rates of live weight gain

Pros

- Feeding in lots is more **economical** and **less time consuming**
  - It results in **increased and more rapid** livestock weight gain

Cons

- Ruminants are suited to eating grass, not grain, leading **animal welfare issues** such as bloating, diarrhoea and digestive discomfort (e.g. E.coli)
- Concentrated feedlot runoff leads to **water contamination**
- Intense gas emissions (ammonia, methane…) **deteriorate air quality**

Pasture finishing is an extensive form of animal prod'n

- The alternative to feedlots is to allow cattle to **graze on rangeland or on immature fields of grain** throughout their lives

- Grass-fed meat contains **less fat**, more benign fatty acids, and **more vitamins**
- Fresher and more natural diets **reduces animal stress** and antibiotic use
- The natural dispersion of manure increases **land fertility**

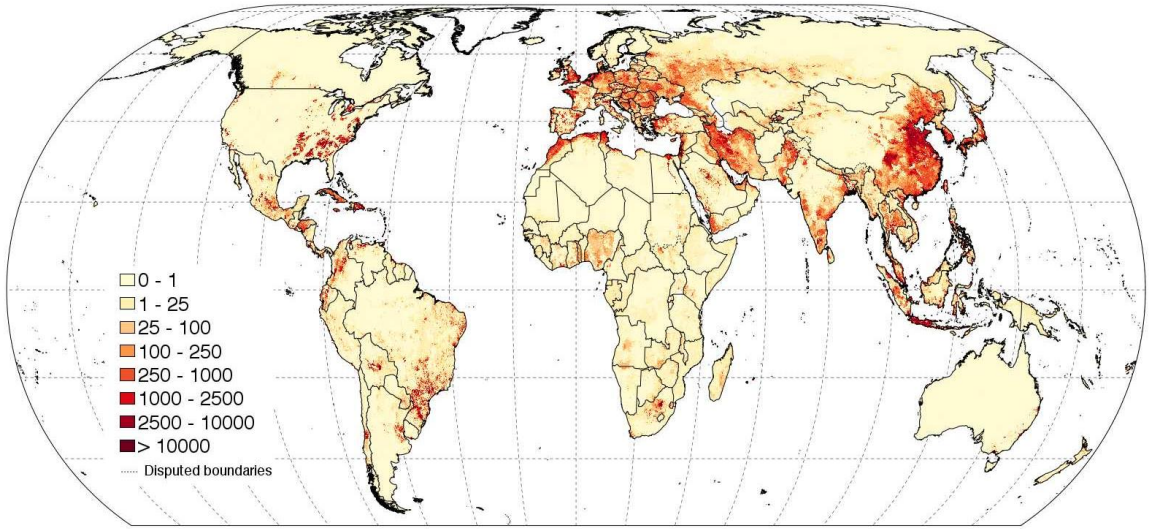
- Pasture finishing is associated with **higher beef prices**
  - E.g. cows go to slaughter at between **18 and 24 months of age versus 14 months** for a feedlot animal

Note: (1) Specialised animal feed usually consisting of corn and other grains, roughage and premixes composed of microingredients (e.g. vitamins, minerals…)
Source: Literature search

According to UN, globally CAFOs[1] account for 72% of poultry and 55% of pork production (1/2)

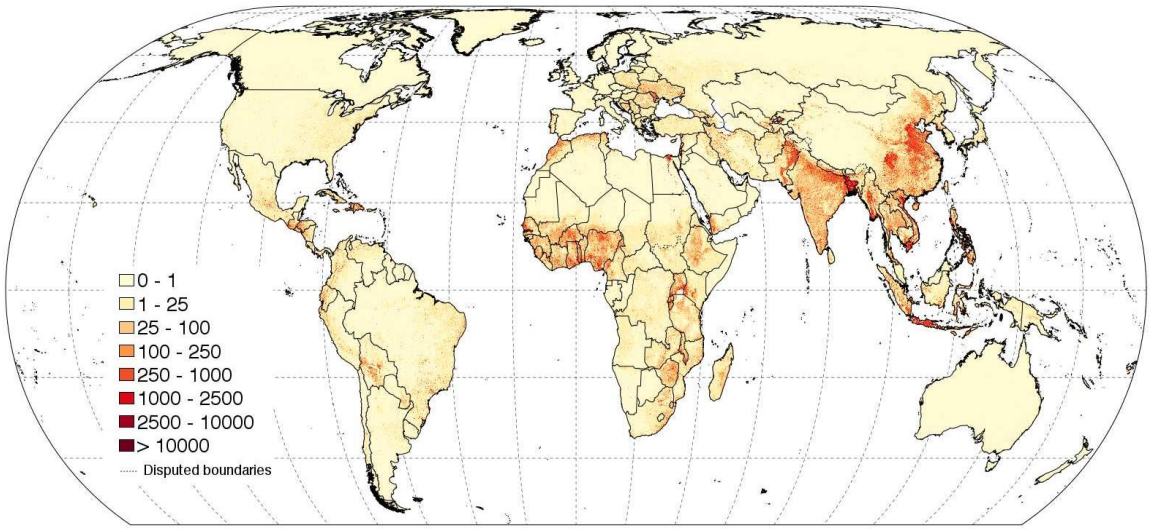
Intensive chicken systems are primarily found in East and South Asia, Europe and US east coast

Chicken in intensive systems per square km in 2010



Extensive chicken systems are primarily found in East and South Asia, Central Africa and Eastern Europe

Chicken in extensive systems per square km in 2010

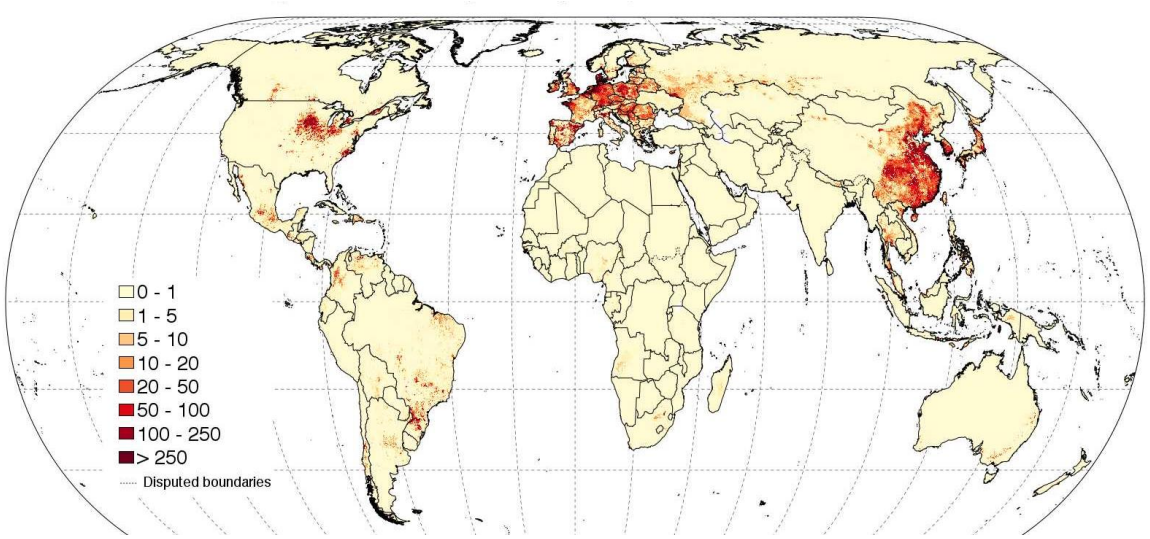


Note: (1) Concentrated animal feeding operation: an intensive animal feeding operation (e.g. feedlots) in which over 1000 animal units are confined for over 45 days a year; Since detailed data on the distribution of intensive livestock production units are not readily available for most countries, global estimates currently available are modelled projections of these, such as the one presented here by the FAO
Source: FAO; UN; Literature search

According to UN, globally CAFOs[1] account for 72% of poultry and 55% of pork production (2/2)

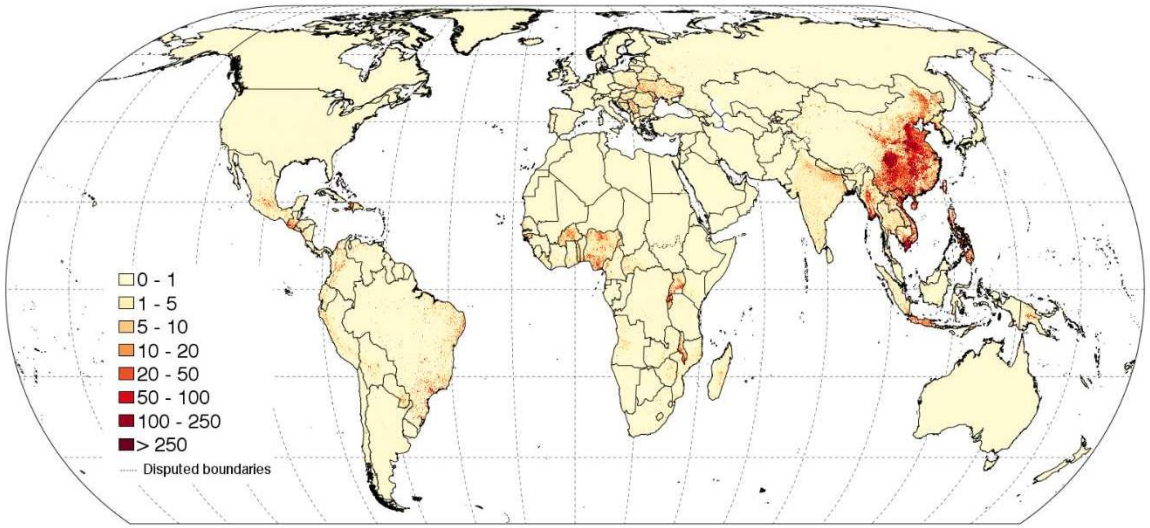
Intensive pigs systems are primarily found in Europe, China and selected US states (Iowa, Minnesota, Illinois…)

Pigs in intensive systems per square km in 2010



Extensive pigs systems are primarily found in East Asia (mainly China)

Pigs in extensive systems per square km in 2010



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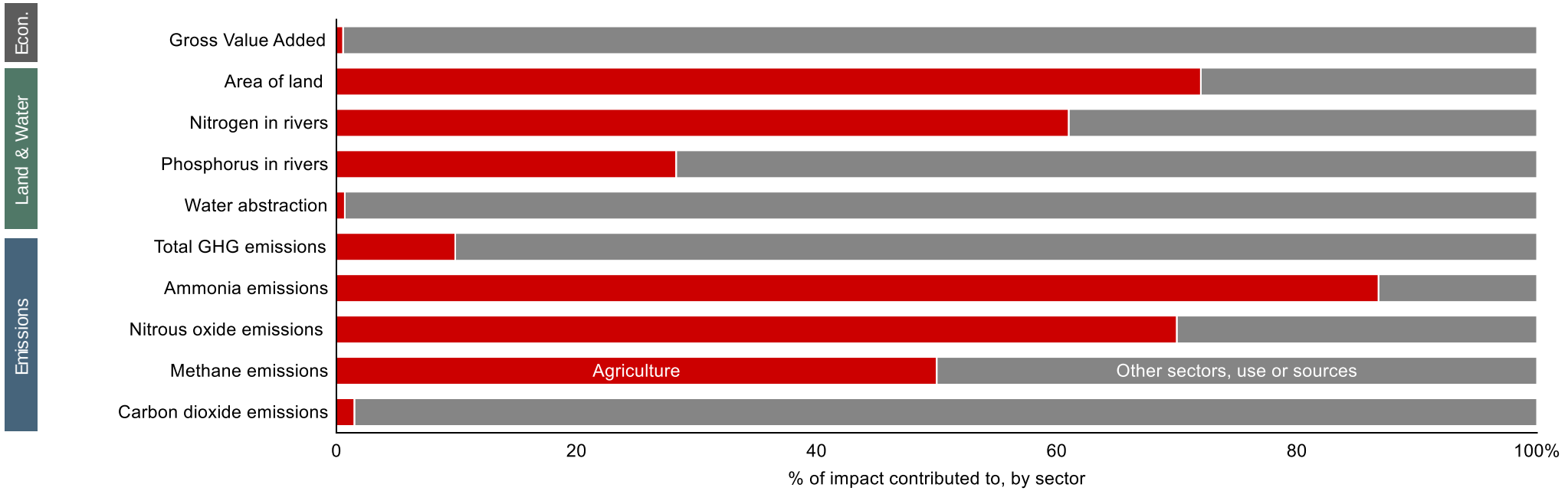
Source: FAO; UN; Literature search

Agriculture has a significant impact on the environment, due to chemicals used, livestock-related emissions, and intensification of land use

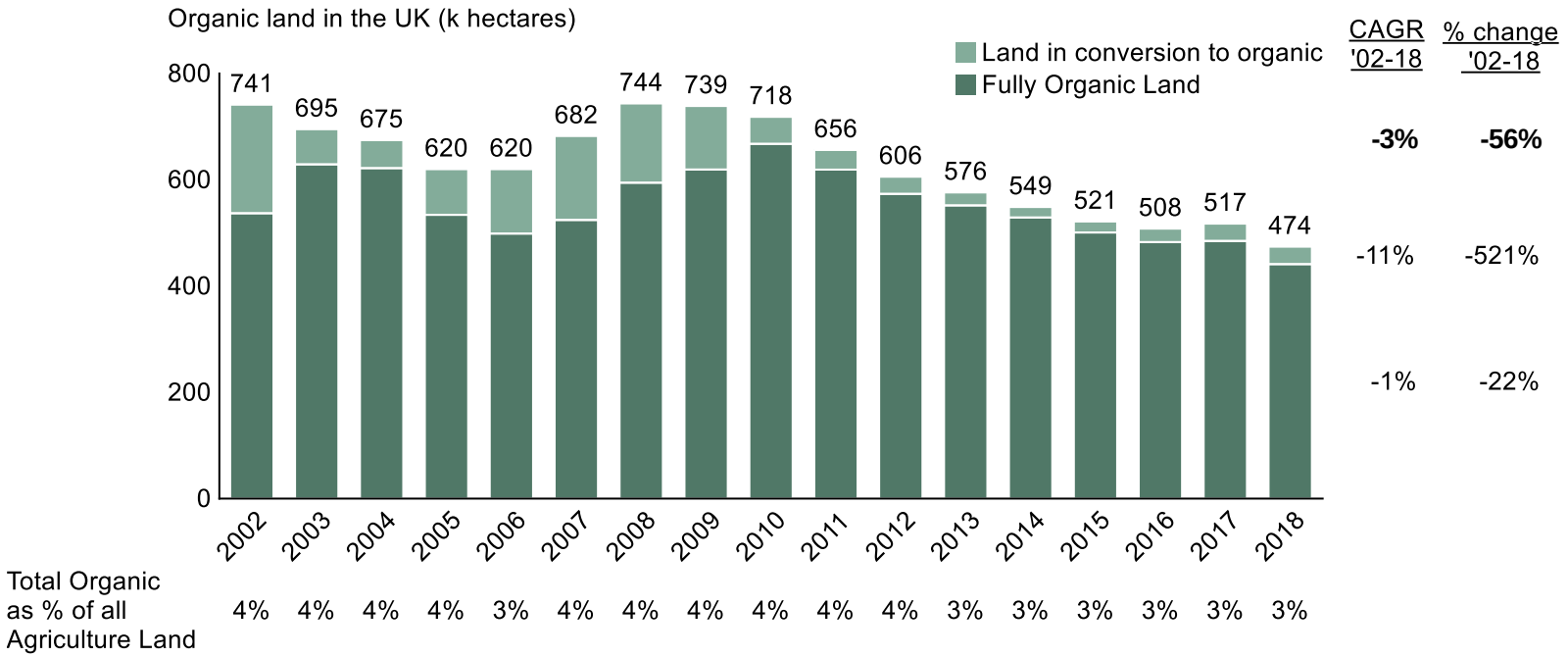
Despite contributing 1% to UK economy, Agriculture is often responsible for high proportion of environmental damage



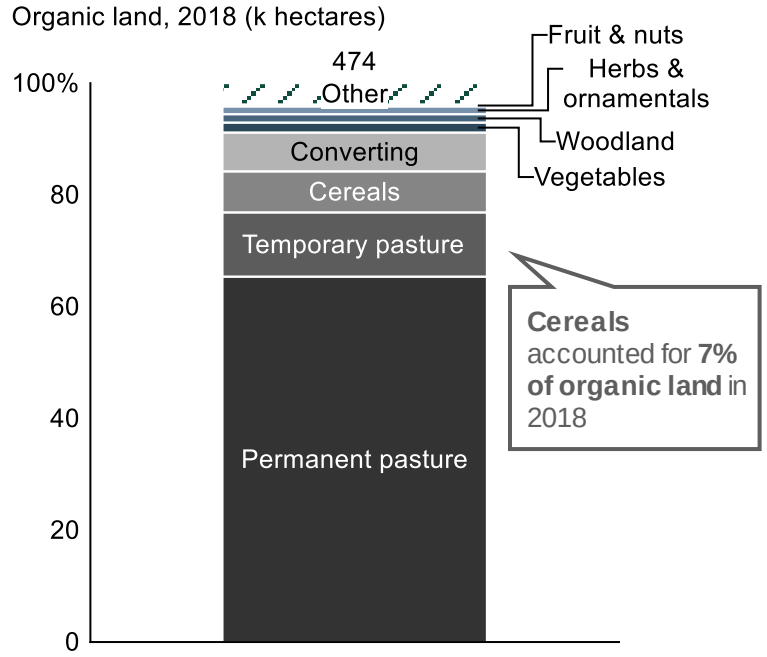
Note: All environmental impact data for UK 2017 except: water abstraction – England, nitrogen in rivers – England & Wales 2004, phosphorus in rivers – Great Britain, 2006, ammonia emissions - 2016;
Source: Agriculture in the UK, Defra, 2018

Organic land has decreased by 56% since 2002; in 2018 ~75% is for pasture and ~5% for crops

Organic land has decreased by 56% since 2002, down from 4% to 3% of total farmland



Majority of organic land is for pasture



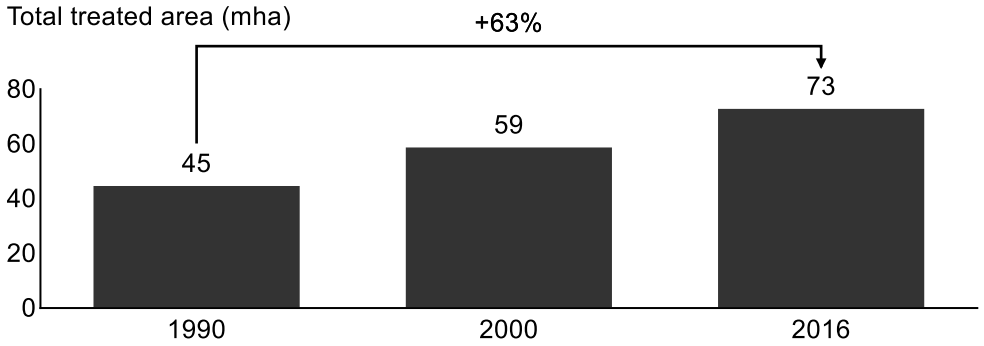
UK Farms, especially cropping farms, are not decreasing their use of harmful chemicals

Note: Land in conversion in 2018 has not been split by land use type; Other includes unutilised land, unknown use, other crops and land set side
Source: Agriculture in the UK, Defra, 2018

Pesticide usage has increased over multiple metrics; wheat contributes the largest amount in terms of hectares sprayed

Pesticide use has increased in terms of land applied to, number of applications and toxicity since 1990

Treated area and average number of treatments have increased, despite **total land area decreasing**



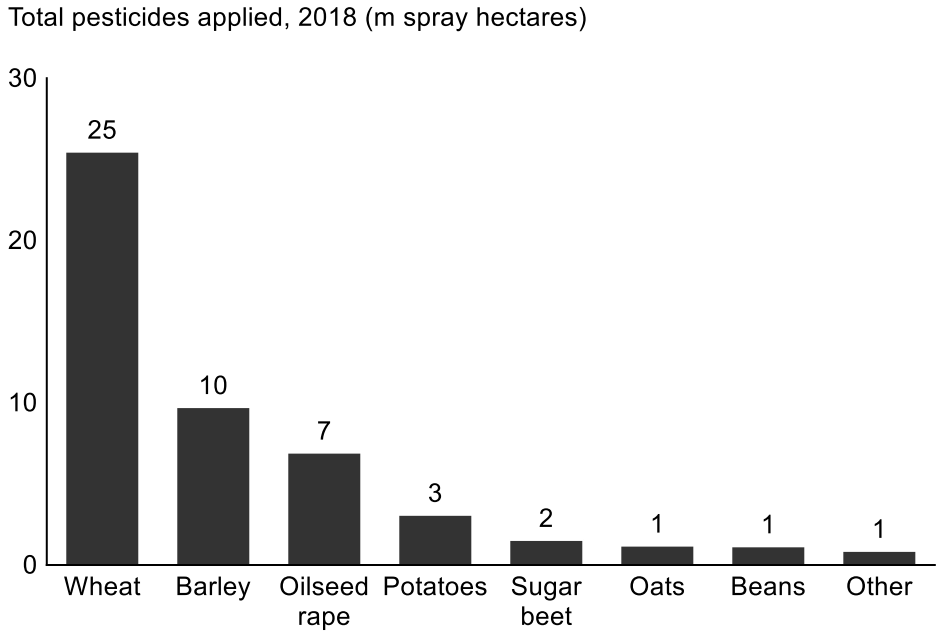
	1990	2000	2016
Average treatments per ha	2.5	3.4	4.2
UK Agricultural area (mha)	18.3	17.5	17.3

"By volume, modern neonicotinoid insecticides are **10,000 times more potent than DDT** (**history's most notorious pesticide** which was banned globally in 2001 due to concerns about harm to the environment and human health)

… Therefore **while the weight of pesticides used in UK agriculture may have decreased, the rise in toxicity means that we are no less exposed to their harmful impacts**"

Pesticide Action Network UK, 2018

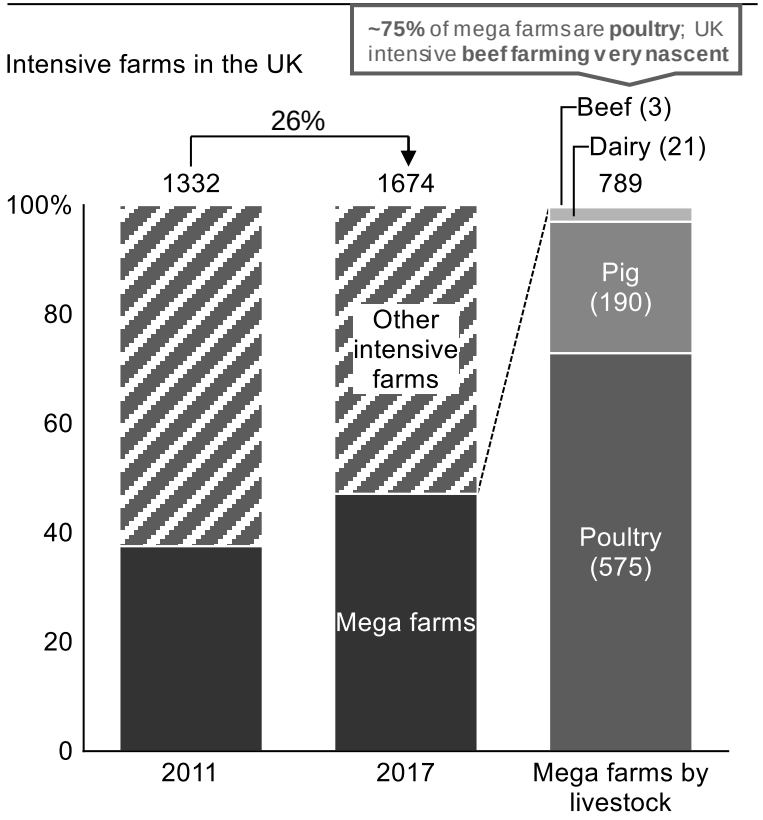
Wheat accounts for majority of pesticide use



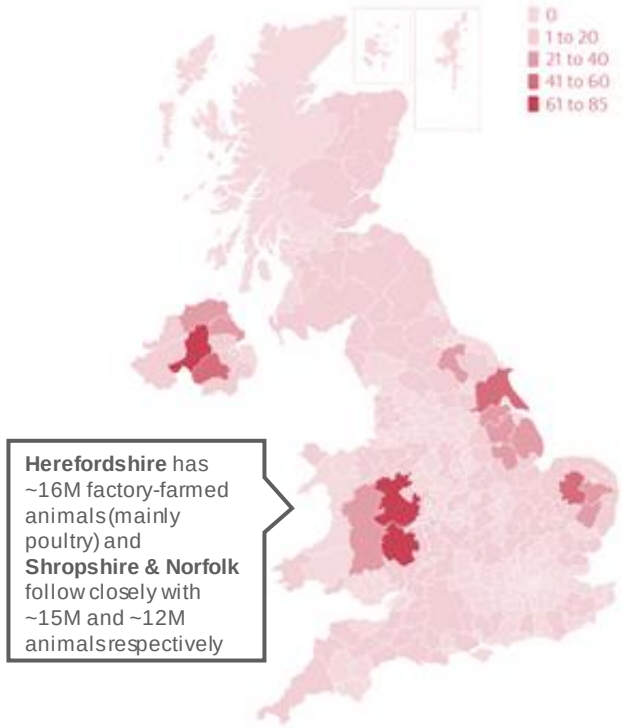
Note: Other includes Rye, Linseed, Triticale and Peas; other crops such as fruits and vegetables not shown as no 2018 data and only accounted for ~10% of hectares treated in 2015
Source: The Hidden Rise of UK Pesticide Use, Pesticide in Action Network UK, 2018 via. The Pesticide Usage Survey Statistics, Fera on behalf of Defra; Agriculture in the UK, Defra, 2019; Pesticide Usage Survey, Fera on behalf of Defra, 2018

There is a growing number of intensive[1] farms in the UK

There has been a ~25% increase in intensive farms since 2011



Growth is concentrated where major food companies operate



Number of permits for intensive poultry farming by local authority since 2002

There are several reasons behind growth of intensive farms. These include:

- The rise in intensive farming has increased as **Britain's demand for cheap meat**, especially chicken rose
  - Review of five major supermarket chickens shows basic chicken raised on **intensive farms costs £2.36/ kg vs £6.52/ kg for organic chicken**
- The number of farms in the UK is falling.
  - About **4,000 farms closed between 2010 and 2016**, of which three quarters were in the smallest category (>20 hectares of land)

*"The increased land price combined with falling goods' prices meant **family farmers couldn't compete with larger farms**, who can make far more profit thanks to scale economies."*

Pippa Woods, Family Farmers' Association

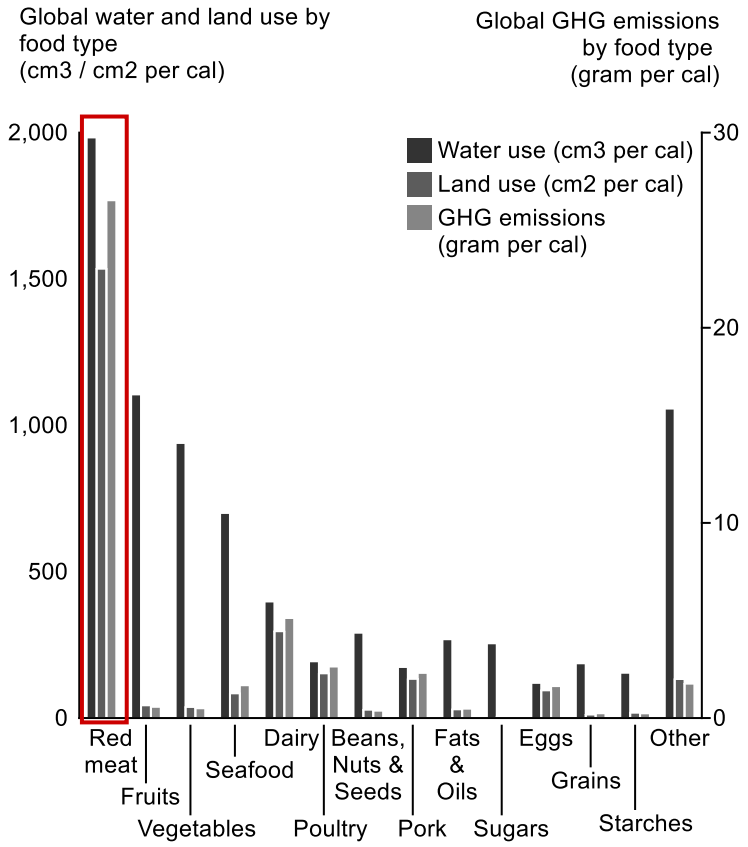
*"Farmers have to operate intensive systems to **compete with cheap European imports**, and there is a lack of consumer demand for free-range meat."*

Dr Zoe Davies, CEO National Pig Association

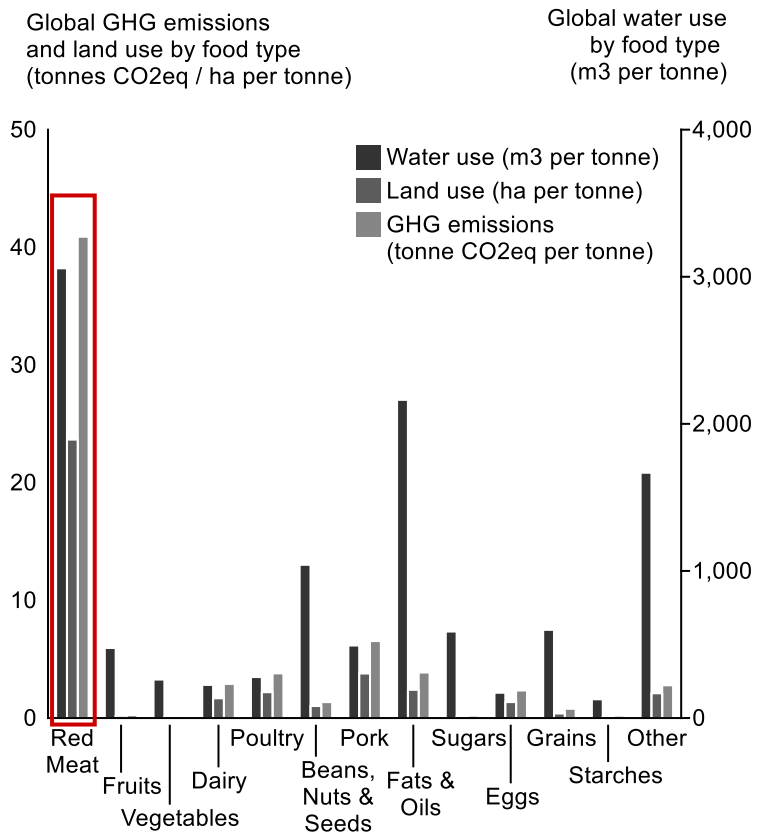
Note: (1) The Environment Agency - and its regional counterparts in Northern Ireland, Scotland and Wales - classify livestock farms as "intensive" if they have capacity for housing at least 40,000 poultry birds or 2,000 pigs grown for meat or 750 breeding pigs (sows)
Source: The Bureau of Investigative Journalism; Literature search

Red meat is the most resource intensive from a per tonne, per calorie and UK consumption basis; dairy also high in terms of UK consumption

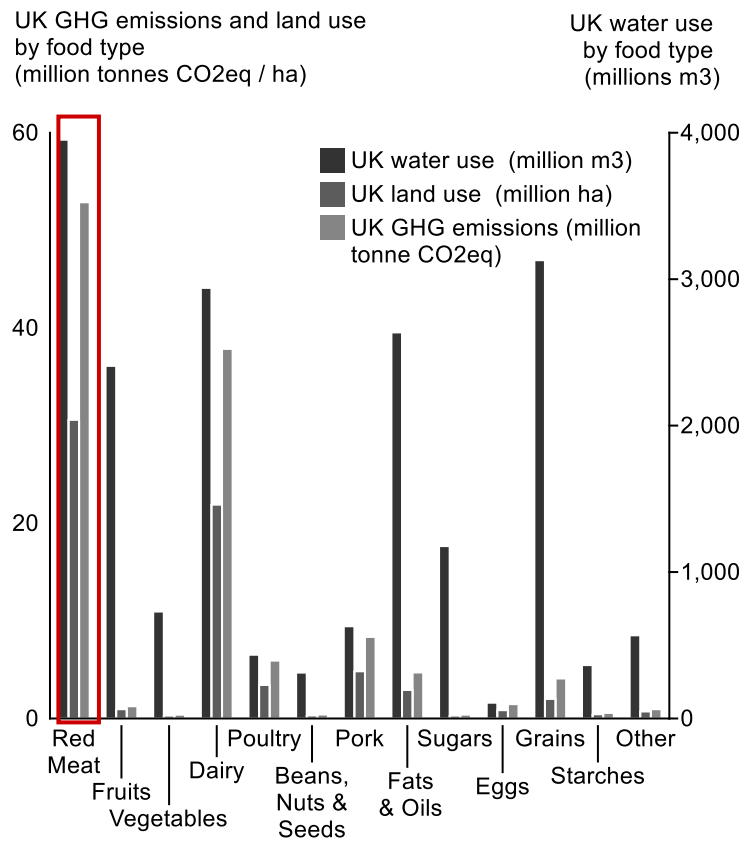
Average global resource use per calorie of product type



Average global resource use per tonne of product type



Total UK resource use by product type based on global average



Note: Food yields on resources calculated on the global level and applied to food consumption at the regional level; Seafood (farmed) is based on channel catfish production in the US produced in pre-existing bodies of water; Source: FAOStat, 2013; World Bank 2013 Population; EPA

We are not optimally using the land available; largest 8% farms produce 57% of output using only 33% of farmed land

/ENGLAND ONLY

Economic size classification	Very small	Small	Medium	Large	Very large
Standard output	Under €25K	€25K to €125K	€125K to €250K	€250K to €500K	At least €500K
% of total farm businesses	41%	30%	12%	9%	8%
Number of farm businesses (#)	38,700	29,200	10,800	8,600	7,100
% of total output (€M)	2%	11%	12%	18%	57%
% total farmed area (K Hectares)	7%	21%	18%	21%	33%

Note: Standard output is a measure of total value of output of any one enterprise – per head for livestock and per hectare for crops; ; Number of farm businesses does not split out multiple farm holdings within same farm business
Source: 'The Future Farming and Environment Evidence Compendium', Defra, 2019

Technology to improve efficiency and/or reduce environmental impact is available, but adoption is still relatively low in the UK

New technologies can improve yields and/or reduce environmental impact

Examples

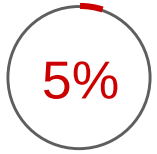
- **Precision fertilisation** for more targeted application of inputs
- **Robotic milking systems** to save labour costs
- **Controlled traffic farming** to reduce damaging soil compaction
- **Electronic Identification (EID)** to improve use of livestock flock resources
- **Site-specific crop management** to measure how conditions vary within a field and adjust treatments accordingly

"Benefits [of precision farming] include **improved animal health, greater crop yields and reduced environmental impacts**"

Parliamentary Office of Science & Technology, 2015

However, adoption remains relatively low in the UK

Of suitable farms in the UK use **controlled traffic farming**



Percent of UK dairy cows milked with **robotic milking** systems

Of sheep farmers in England and Wales have **adopted precision livestock farming techniques**

"The use of some precision farming techniques is **more common in other countries** than in the UK"

Parliamentary Office of Science & Technology, 2015

Low adoption could stem from under-funding, frictions and skills gaps

Underfunding

- '**High initial cost**' cited as a reason by majority of farmers not adopting precision farming
- Whilst public sector R&D spend is higher/comparable to other European countries, work to **translate research into practice** has historically been underfunded in the UK
- **Private sector R&D** investment has remained constant at ~1.1% of GDP since 1995, compared to OECD average of 1.6%

Friction between farmers and government/research community

- E.g. Lima et. al. found that a barrier to adoption of livestock precision technology in England & Wales is the **belief that "government pressurise farmers to adopt technology"**

Skills gaps

- **IT literacy** is a key characteristic predicting adoption of precision technology
- UK has a lower share of farm managers with **formal training** vs other countries (32% in UK vs 72% in Netherlands and 68% in Germany)

Note: Precision livestock farming is the use of advanced tech to optimise the contribution of each animal - e.g. electronic wearables to identify illness, activity patterns, and other issues
Source: Eurostat EU Farm Structure Survey; Agriculture & Horticulture Development Board Horizon magazine 2018; Defra, 2019; Parliamentary Office of Science & Technology, 2015; Gov.uk, 2018; HM Government, 2013; Drivers for precision livestock technology adoption, Lima et el, 2019

Diagnosis: point of departure

Our Food System Today

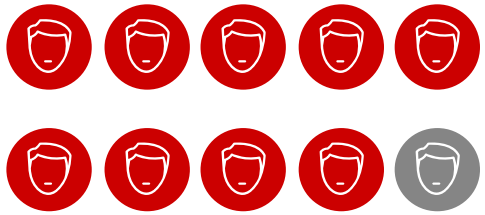
Climate, nature and land

Diets and health

Inequality

Diets today: People are increasingly aware of the need to eat healthily

As consumers become more conscious about eating healthily…



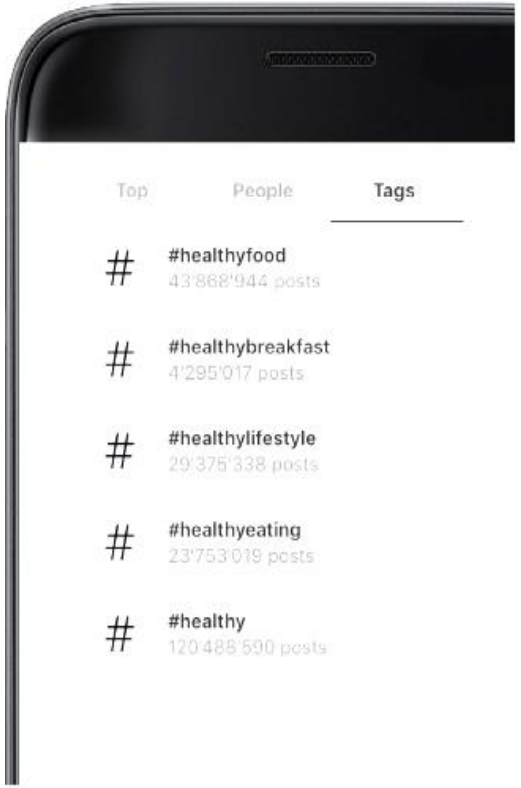
90%

of people said they consider eating well to be important or very important to how they feel about their health overall.

10X increase in

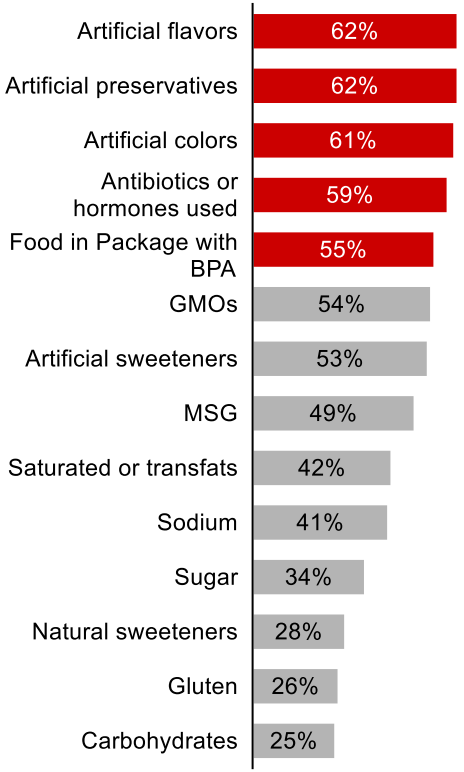
Searches that include the words "best food for" since 2005., often followed by e.g. "health", "skin", "energy", "the brain" and "gym workout".

220 million tags

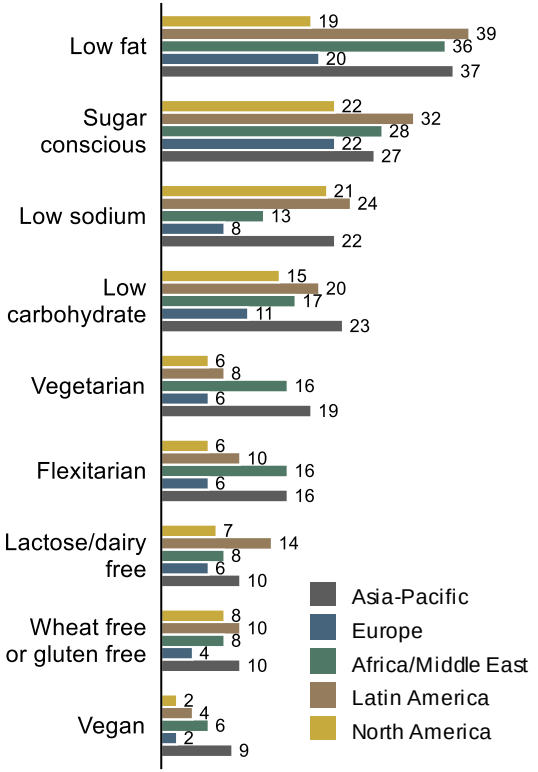


…they are increasingly sensitive about what's in their food and are making dietary choices to help prevent health conditions

% respondents who say they try to avoid a specific ingredient or attribute (global average)

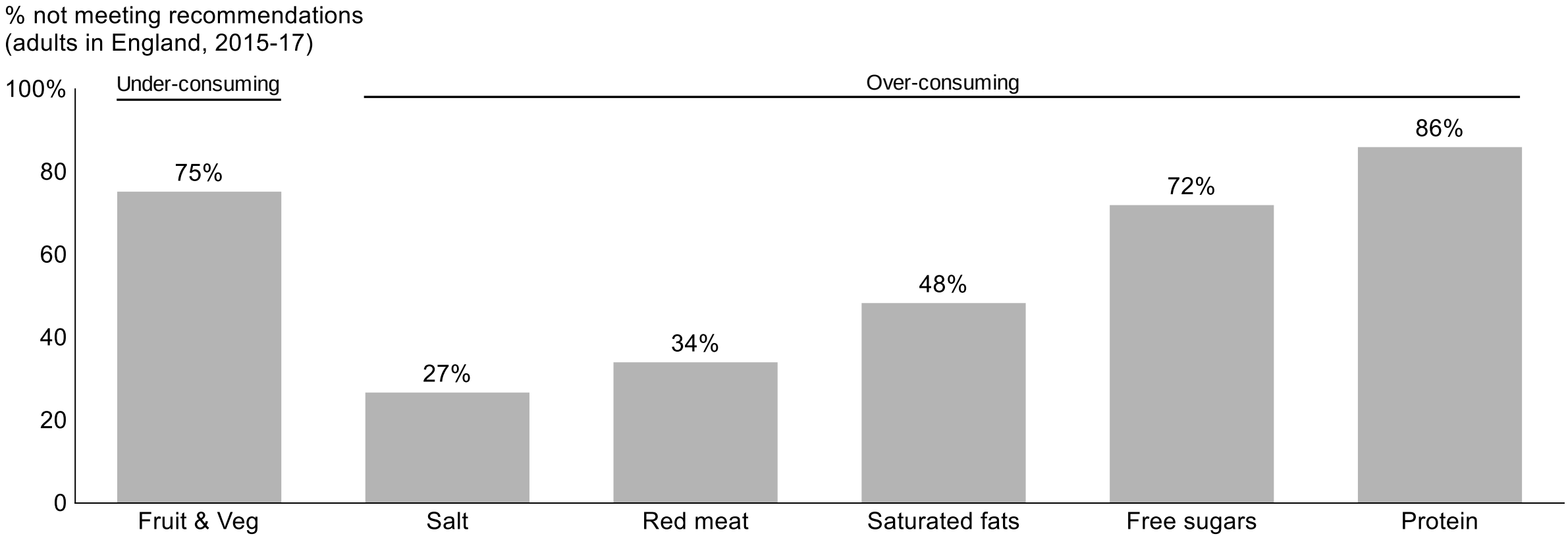


% respondents who say they follow a special diet that limits and/or restricts specific foods or ingredients



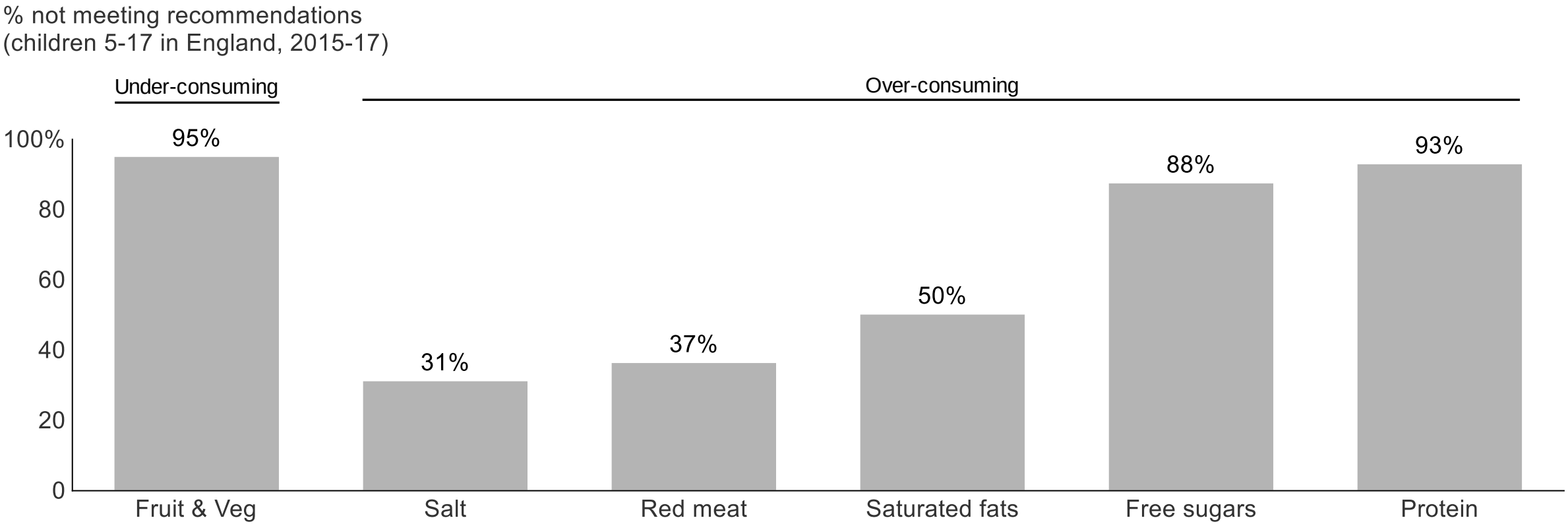
Data from: "What's in our food and our minds", Nielsen, 2016

Diets today: However, most of the adult population are under or over consuming on key nutrients



Note: Meeting recommendations is defined here, relative to the Eatwell guide, as under-consuming on fruit & veg, and over-consuming on everything else; selected 5 UK Eatwell Guide recommendations to show breadth of under and over-consumption of England pop; there is a believed underreporting in the NDNS ~25% of kcal, here the consumption appears as reported
Source: NDNS survey; UK Eatwell Guide

Diets today: A large majority of children are under or over consuming on key nutrients



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Source: NDNS survey; UK Eatwell Guide

Diets today: Consumption of ultra-processed foods leads to increased calorie intake and greater risk of cancer, depression and cardiovascular disease

The NOVA 4-part food classification system

1. Unprocessed or minimally processed foods
   - Obtained from plants or animals or through minimal processing such as cleaning or freezing (e.g. eggs, nuts, herbs)
2. Processed culinary ingredients
   - Extracted from natural foods by processes such as pressing, grinding, crushing and refining (e.g. sugar, butter, honey)
3. Processed foods
   - Manufactured by industry with Group 2 substances added to Group 1 substances to preserve or to make them more palatable (e.g. bacon, freshly-made cheeses, canned fruit)
4. Ultra-processed foods
   - Industrial formulations made entirely or mostly from substances extracted from foods, derived from food constituents, or synthesized (e.g. biscuits, margarine, pre-prepared pizza)

Health impact of ultra-processed foods

- In a controlled trial, people on ultra-processed diets consumed ~500 calories more than those on unprocessed diets
- Increasing the proportion of diet from ultra-processed foods by 10% could lead to:

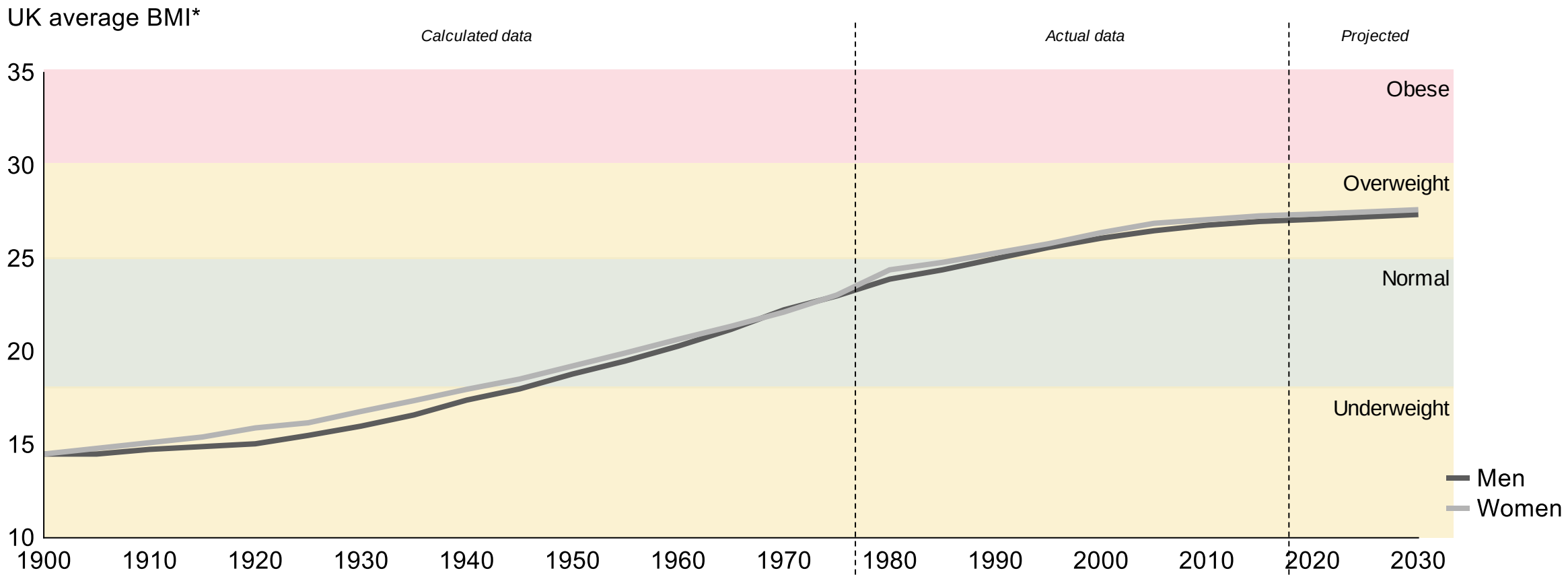
Increase in cancer risk

Increase in risk of depressive symptoms

Increase in cardiovascular disease risk

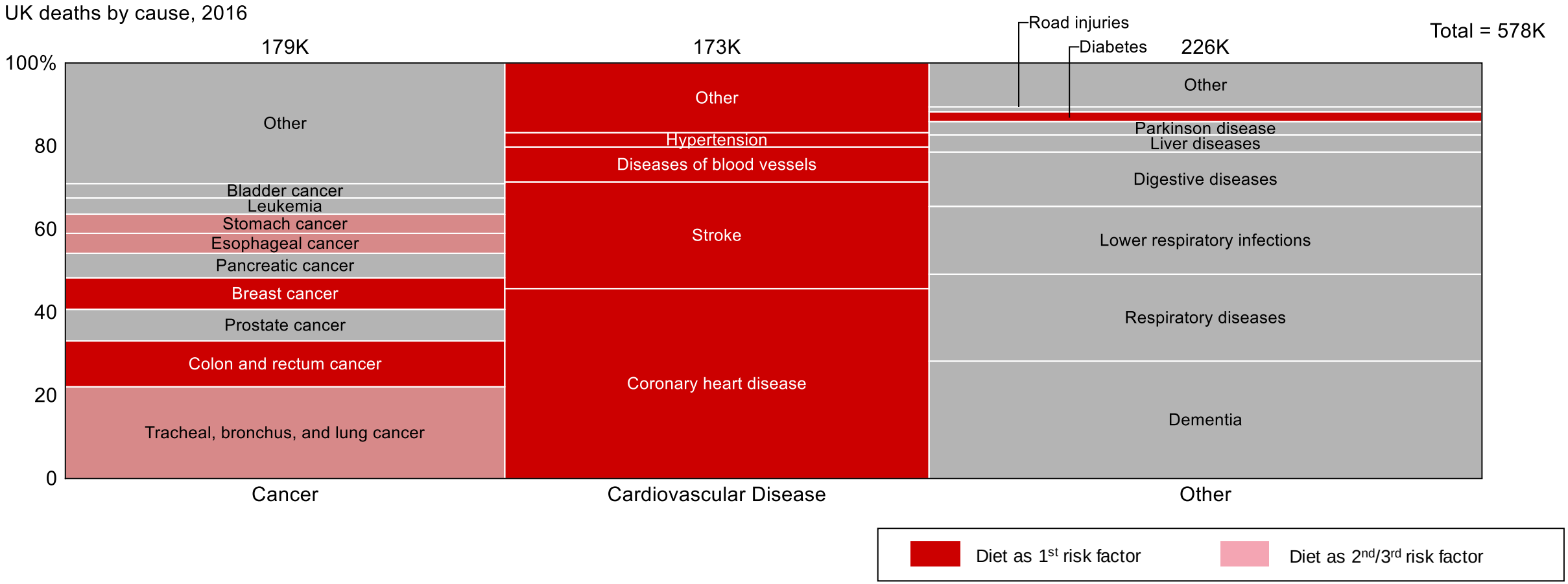
Source: "Ultra-processed foods, diet quality, and health using the NOVA classification system", C Monteiro et al, 2019; "Consumption of ultra-processed foods and cancer risk: results from NutriNet-Santé prospective cohort", C Monteiro et al, 2018; "Prospective association between ultra-processed food consumption and incident depressive symptoms in the French NutriNet-Santé cohort", M Adjbade et al, 2019; "Ultra-processed food intake and risk of cardiovascular disease: prospective cohort study", C Monteiro et al, 2019

Poor health outcomes: UK average BMI has steadily increased over the past 100 years (14% increase since 1977)



Note: (*) Raw data only available from 1977 onwards for EuroMonitor; US data for white males and white females used as a proxy to project back to 1900 and therefore BMI likely to be overstated in war and post-war years
Source: EuroMonitor; "The trend of BMI values of US adults by centiles, birth cohorts", John Komlos & Marek Brabec, 2010

Poor health outcomes: However, many of the major causes of death have dietary risk as one of the main risk factors

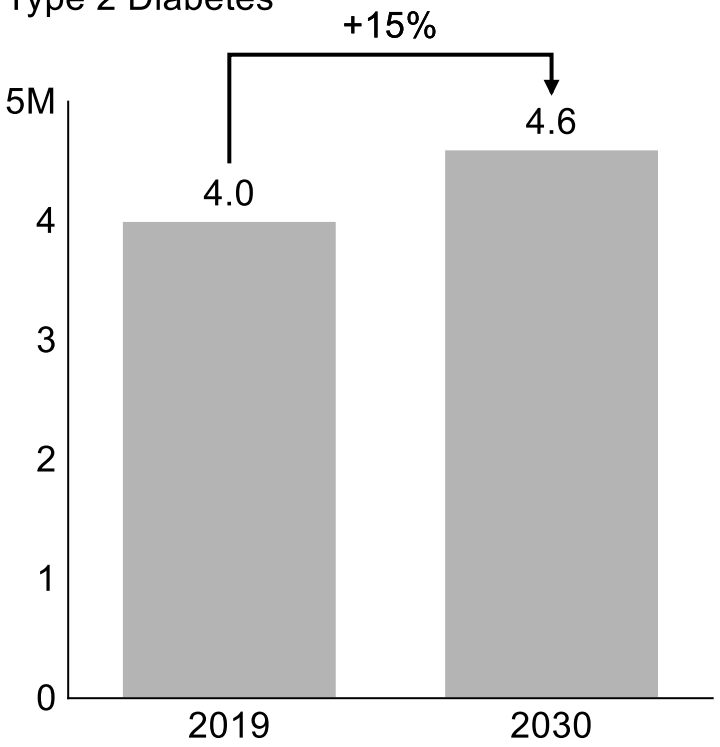


Source: Death tolls taken from "Our world in data, causes of death", 2016; Breakdown of CVD's from "Cardiovascular Disease Statistics", BHF, 2014; Risk factors associated with diet from Global burden of disease risk factors, Institute of health metrics and evaluation, 2006

Poor health outcomes: Diet-related illnesses are projected to grow significantly over the next 10-20 years

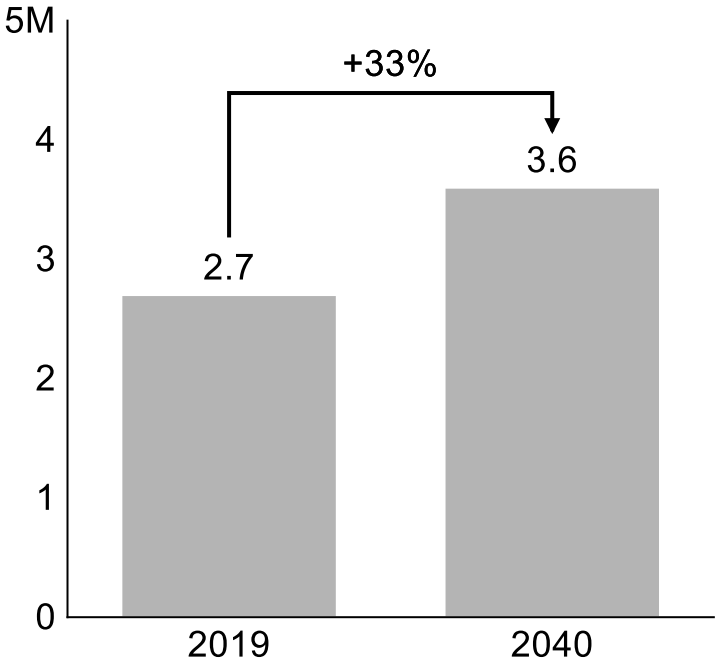
Growing 1.3% each year for next 10 years

People in the UK with
Type 2 Diabetes



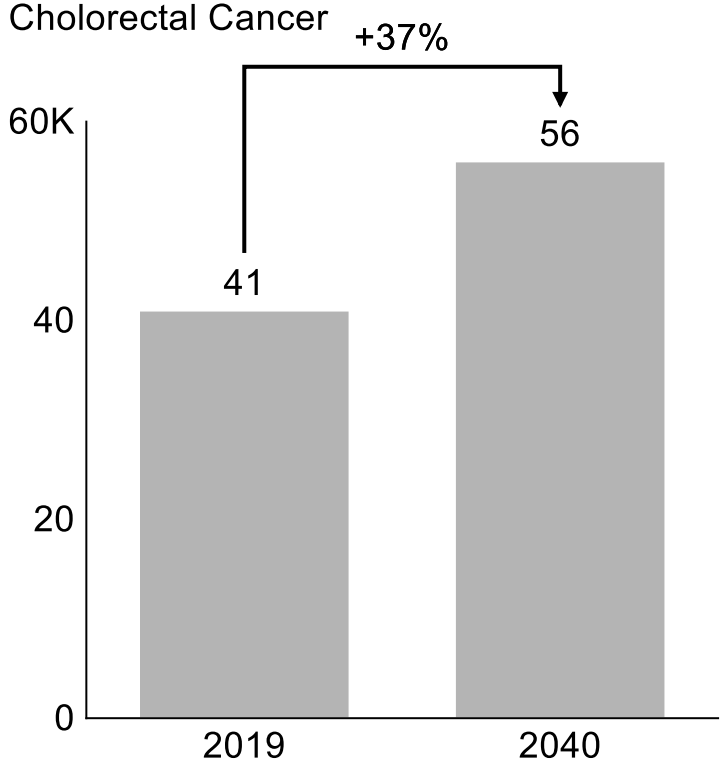
Growing 1.4% each year for next 20 years

People in UK with
coronary heart disease



Growing 1.4% each year for next 20 years

People in the UK with
Cholorectal Cancer



Notes: Diabetes estimates based on Health Survey for England data. Future projections of the number of prevalent cases are due to changes in the composition, obesity rates, and size of the overall population. CHD estimates based on Health Survey for England data. Estimate have taken diagnosed prevalence as constant for age and gender groups. As such, the prevalence projections are due to changes in the size and composition of the overall population. Colorectal estimates based on ONS and UN data. Forecasts for colorectal cancer take into account a combination of lifestyle changes (diet, exercise, obesity, and smoking) and screening. A conservative declining age and gender-specific trend based on historical data is used, and expectations about the changes in screening test used, coverage, and uptake over the period are included. Source: Decision Resource Group, 2013-2015; 2019 taken as today's figure

Poor health outcomes: The current UK food system generates ~£54B in food-related health costs from consumption and production in terms of DALYs

Unhealthy diets are key risk factor for many diseases, but generate costs to society and individuals over and above healthcare costs

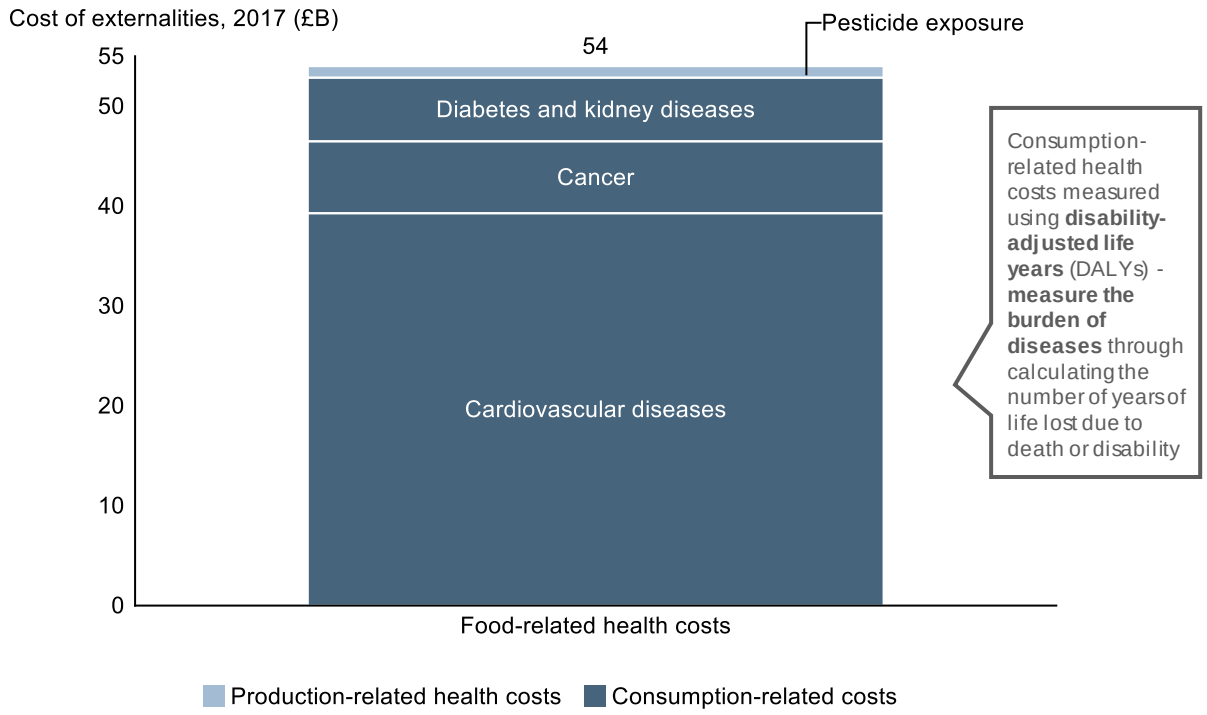
"**Unhealthy diets** and lack of physical activity are **risk factors for developing a range of chronic diseases** such as diabetes, cancer and cardiovascular disease"

World Health Organisation, 2017

"They [unhealthy diets] not only **reduce people's quality of life and life expectancy**, but also place a **burden on our health systems and our economies, and on society** as a whole"

World Health Organization, 2017

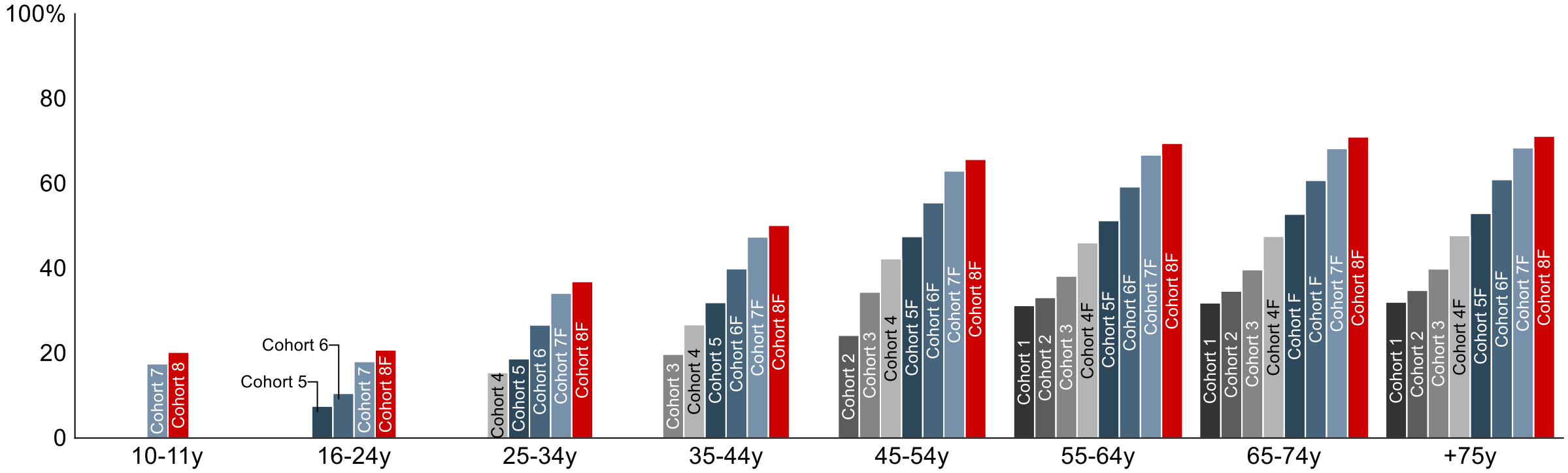
From a Disability Adjusted Life Years (DALYs) view, ~75% of diet-related health costs attributable to cardiovascular diseases



Note: Cost of DALYs assumed to be UK 2017 GDP per capita in purchase power parity ($PPP*) = $44,497 (£33,119); GBP to USD conversion rate of 1.34 used; *PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates, an international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States; DALY cost based on GDP PPP as per FOLU report; full detail on calculations and assumptions in appendix; full detail on how diet-related DALYs calculated in Lancet report (2019)
Source: Institute for Health and Metrics Evaluation Global Health Data Exchange (IHME GHDx), 2017; World Health Organisation, 2017; Euromonitor, 2017; NHS, 2019; "Growing Better", Food and Land Use (FOLU) Coalition / Systems IQ, 2018; Pesticide Use, FAOSTAT, 2017; "Lifecycle human health impact of 857 pesticides", Fantke & Jolliet, 2016; Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017, GBD 2017 Diet Collaborators, The Lancet, 2019

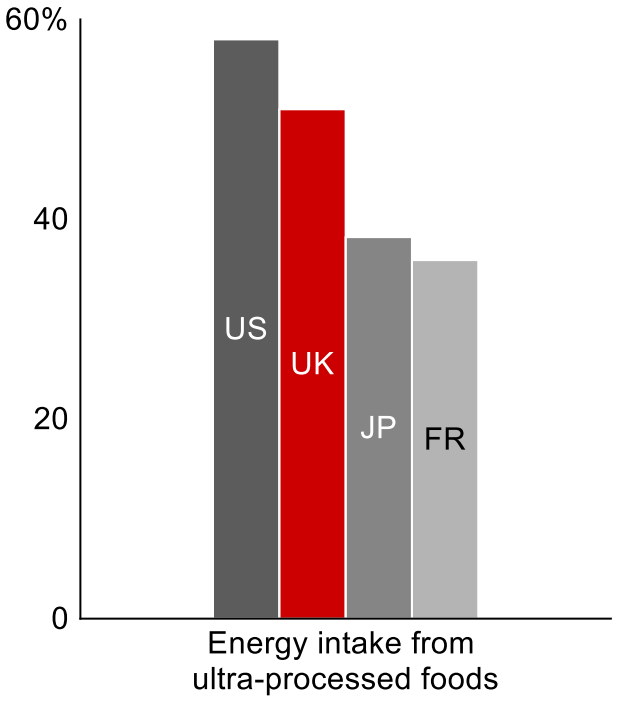
Future obesity rates: If obesity prevalence grows at the same rate as previous cohorts, by the time current 10-yos are 50, 66% could be obese (~60% higher than 50-year-olds in 2017)

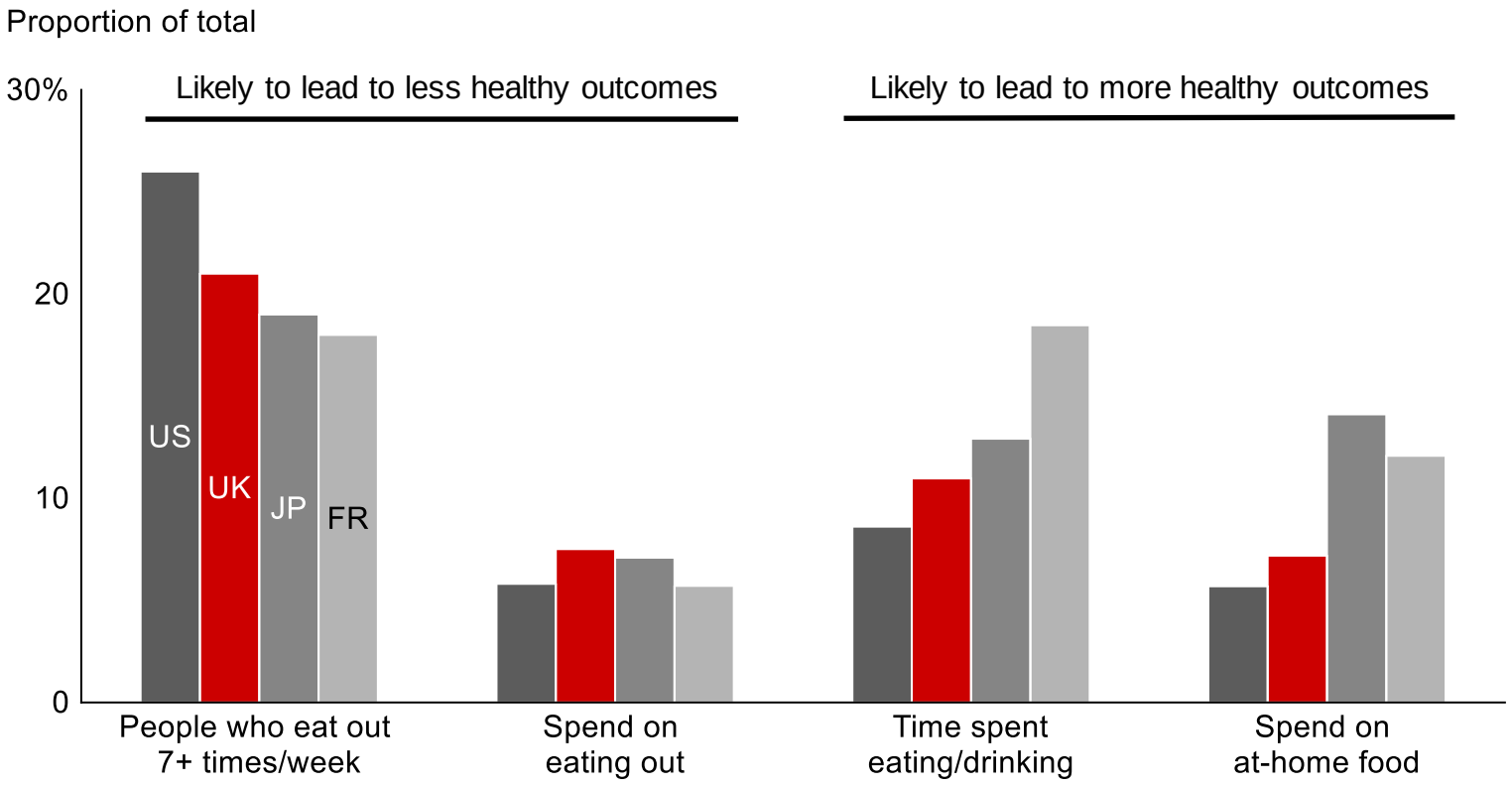
Obesity prevalence per age range
and cohort in 1997, 2007 and 2017 (%)



Note: For adults, Overweight (24.9kg/m2 < BMI < 30kg/m2) and Obese (BMI>30kg/m2). For children categorisation is dependent on age and gender; Projections assume BMI growth per period at the same rate as most recent study for that period; Normal distribution of population around the mid point of each age range and 75+ assumed 85 years old on average for projections.
Source: Health Survey of England 2017 for adult cohorts; National Child Measurement Program for 10-11 year olds

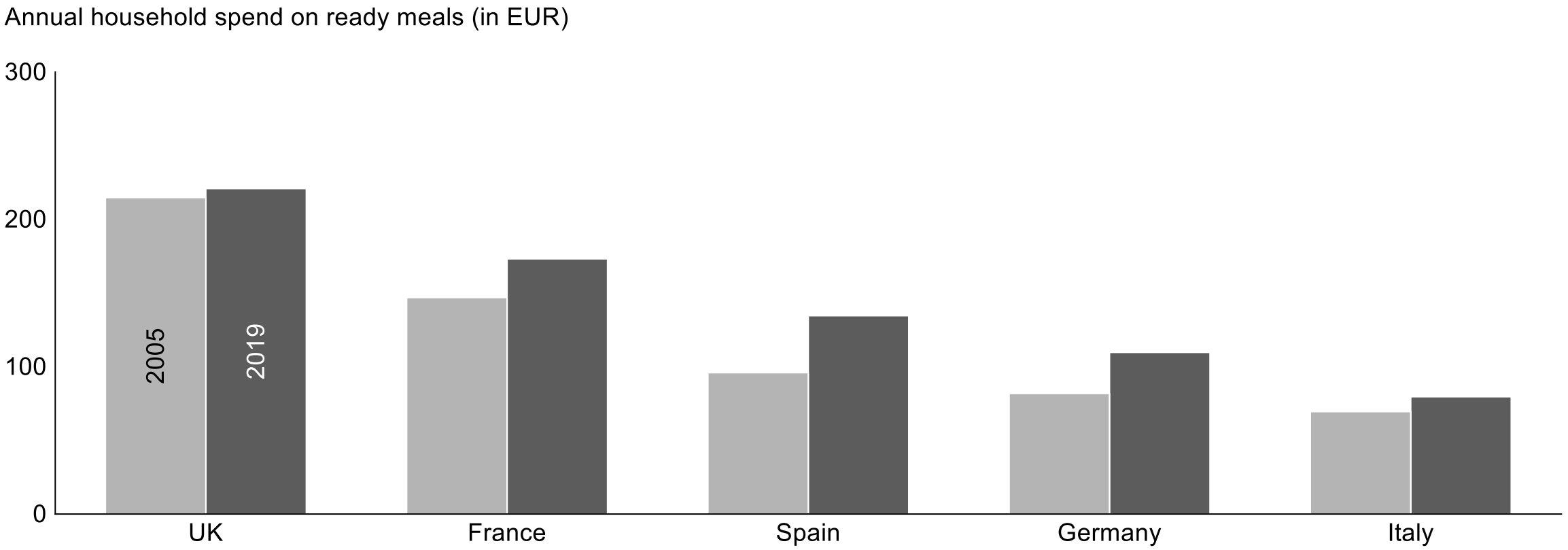
Cultural factors: The UK is most closely related to US in terms of eating habits; data suggests preference for quick and cheap food





Note: Ultra processed foods as defined by the NOVA classification. UK number is for at-home consumption; Spend is before housing costs
Source: Ultra-processed foods: Household availability of ultra-processed foods and obesity in nineteen European countries, C Monteiro et al, 2018 (UK), Ultra-processed foods and added sugars in the US diet: evidence from a nationally representative cross-sectional study, E Steele et al, 2015 (US), Consumption of ultra-processed foods decreases the quality of the overall diet of middle-aged Japanese adults, K Koiwai et al, 2019 (JP), Prospective association between ultra-processed food consumption and incident depressive symptoms in the French NutriNet-Santé cohort, M Adjibade et al, 2019; Eating out: Euromonitor, 2016; Time spent: OECD, 2015, Spend at home and out-of-home: Euromonitor

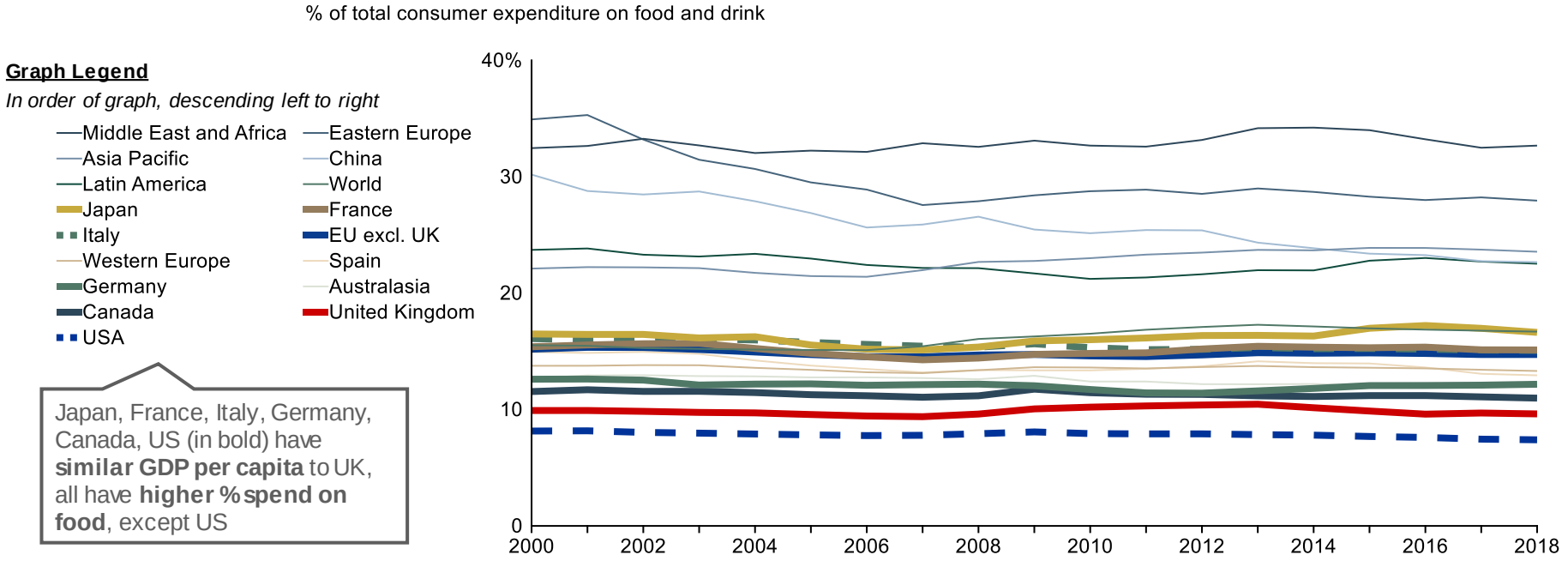
Cultural factors: The UK spends between ~30% and ~180% more per household on ready meals than its European neighbours



Source: Euromonitor, 2019

Cultural factors: UK consumers' spend on food and drink as a % of total spend is lowest of EU countries and decreasing faster than US

UK consumers spend ~10% of total expenditure on grocery food & drink, vs. ~15% for the EU and ~7% for the US



Japan, France, Italy, Germany, Canada, US (in bold) have **similar GDP per capita** to UK, all have **higher % spend on food**, except US

UK food expenditure as share of spend has fallen 0.8pt since 2013

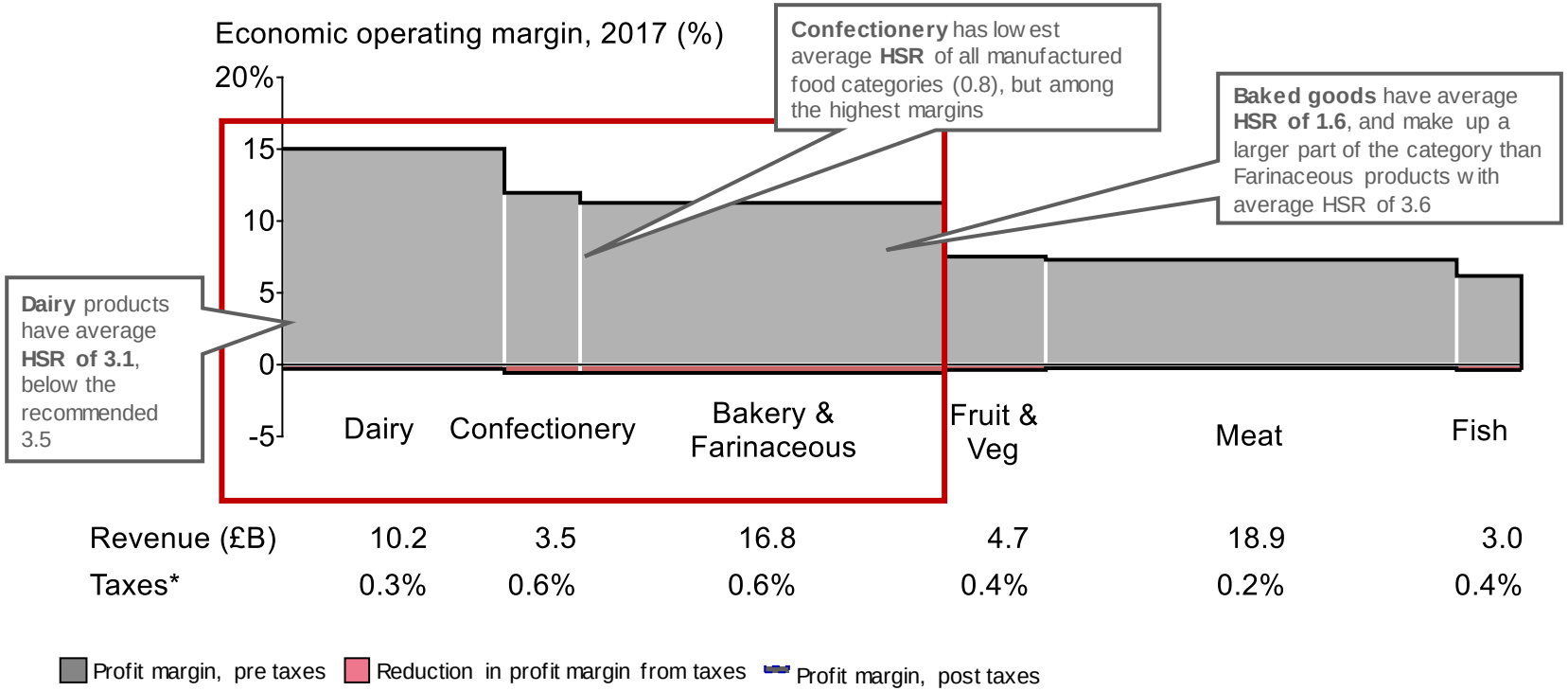
	Since 2000 ppt Δ '00-18	Last 5 years ppt Δ '13-18
EU	-0.5	-0.2
US	-0.8	-0.4
UK	-0.3	-0.8

UK food spend as a % of consumer spend is **lower than the average in all continents**, except the US

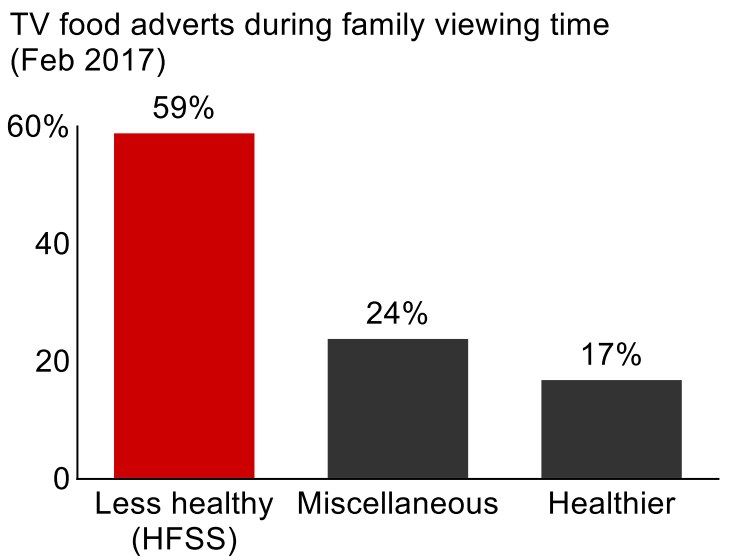
Note: EU figures represents weighted average of 27 EU member states, excluding the UK; Consumer spend on food and drink includes spend on food, non-alcoholic beverages and alcoholic beverages for consumption at home, does not include spend on restaurants, catering or cooked dishes prepared in restaurants for consumption off premise (e.g. delivery or take away); Consumer expenditure is equal to household expenditure plus non-resident household expenditure, minus expenditure abroad; Total consumer spend includes personal expenditure on goods and services, including rent; Largest 9 EU countries in terms of population shown; Source: Euromonitor

Food system: Less healthy products are generally more profitable, resulting in manufacturers focusing on producing / marketing them

Being down experience curve and current economies of scale make processed products relatively more profitable than alternatives…



…and more heavily advertised



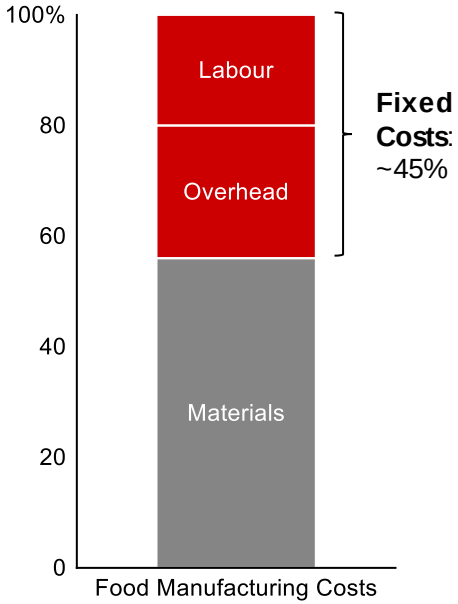
- Products classified by Obesity Health Alliance based on overall nutritional content of products shown, using the government's Nutrient Profile Model*

Note: Bar widths reflect segment revenues; Charts show aggregate of relevant Process and Manufacture value chain segments for each product type; Fruit & Veg excludes potatoes; Economic profit margin calculated from ABS data as: Total turnover – (Employee cost + Total purchases + Taxes + Inventory decrease); Interest and D&A cost not included as not available from ABS; *Taxes shown as % of revenues; Health Star Rating (HSR) ranks product's nutritional profile out of 5, 3.5 considered healthy; revenue shares do not match Euromonitor data due to less granular data cuts available in ABS and inclusion of Processing revenues; Other food groups (condiments, oils, potatoes) with ~£10B revenue not shown; *'Less healthy' indicates the product advertised would be rated as HFSS by the nutrient profile model; 'Miscellaneous' indicates the advert was not suitable for nutrient profiling (e.g. generic supermarket adverts)
Source: Annual Business Survey (ABS), ONS, 2018; UK Product Profile, Access to Nutrition, 2019; Obesity Health Alliance, 2017

Processed food: ~60% of food products are non-perishable; attractive to retailers and manufacturers as can be made and bought in bulk

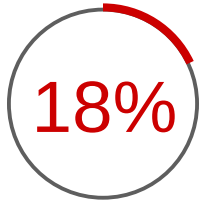
High fixed costs in manufacturing processed / non-perishable foods incentivise high volumes

Average split of COGS for Food Manufacturers (%)



- Manufacturing incurs **high level of fixed-costs**, with overheads and labour costs representing ~45% of COGS
- This encourages manufacturers to **increase volume of sales** and production to **minimise cost per unit**
- **Non-perishable** products are suited to high volume production as their **long shelf-life** allows them to be bulk produced and stored

For retailers, non-perishable foods perform best in promotions as consumers bulk-buy



Of **perishable product** promotions made **positive returns** in 2016

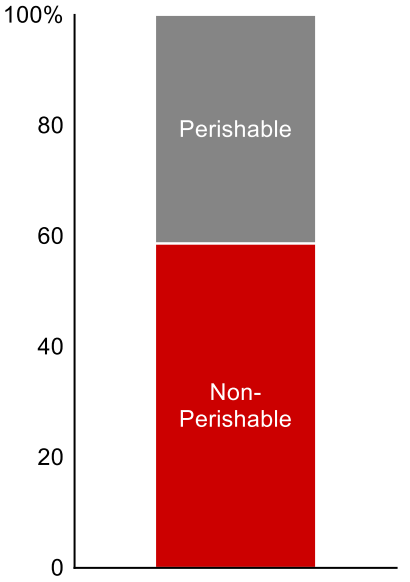
Vs.

Of **ambient / non-perishable product** promotions made **positive returns** in 2016

- Cambridge University researchers found sales uplift from promotions to be higher for unhealthy products as consumers take opportunity to **stockpile non-perishable products**

Unsurprisingly, ~60% of grocery foods sold are non-perishable

Type of food product sold in UK Retailers, 2019 (%)



Note: Manufacturer COGS split based on ~800 manufacturers, split by industry, 3 year averages used; Assumes labour is fixed cost; Perishable / Non-perishable products based on Nielsen data where food categories marked as "Ambient", "Frozen", or necessarily non-perishable (e.g. alcohol, chewing gum, couscous) deemed to be non-perishable
Source: North America Manufacturing Benchmarks, MPI Group, 2007; Trade Promotion performance, Nielsen, 2016; American Journal of Clinical Nutrition, 2015; GB sales by product, Nielsen, 2019

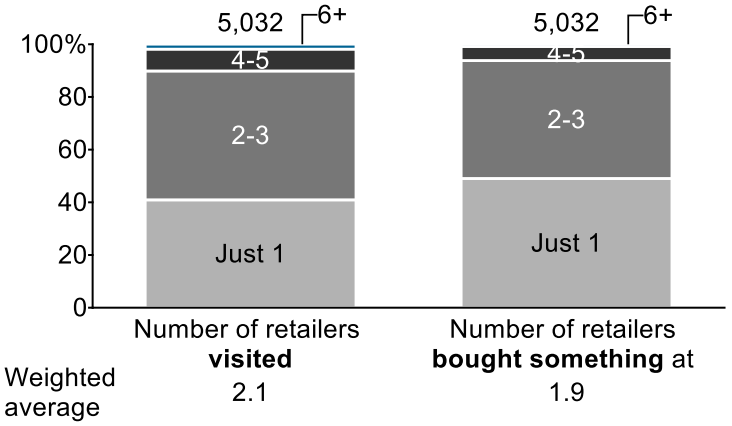
Food system: Volume-driven competition amongst retailers often leads them to prioritise promotions and shelf-space for unhealthy products

Intense price pressure in retail industry means retailers tend to focus on driving revenues through volume

Shopping criteria for shopping at a specific retailer (mentioned as top 3 criteria)

Q: How many different grocers do you typically tend to visit / actually buy something at (in the same trip)?

Average number of retailers shoppers use to browse/shop at (in-store):



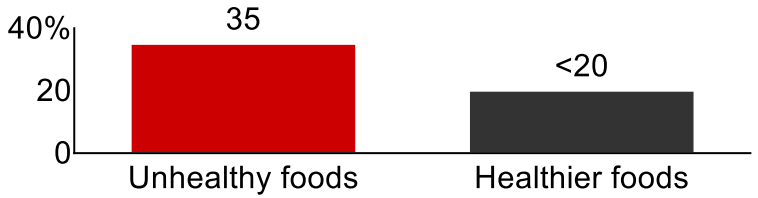
Most common reason for stated in-store shopping preference was **"saves money"**

Consumer focus on prices means retailers seek to increase volumes rather than prices

Consumers are more likely to add volumes of unhealthy products

- A team of Cambridge researchers found that **consumers are more responsive to promotions on unhealthy foods**:

Sales increase following a 10% increase in frequency of promotions



"The researchers believe this may be because **products from less healthy food categories are often non-perishable**, while those from healthier food categories – in particular fruit and vegetables – are perishable: **stockpiling during promotion may therefore be more likely to happen in less healthy food categories**…"

American Journal of Clinical Nutrition, 2015

Source: UK grocery consumer survey 2018 (N=5,032); American Journal of Clinical Nutrition, 2015

Cultural factors: UK consumers are very price/value focused and will shop around to save money

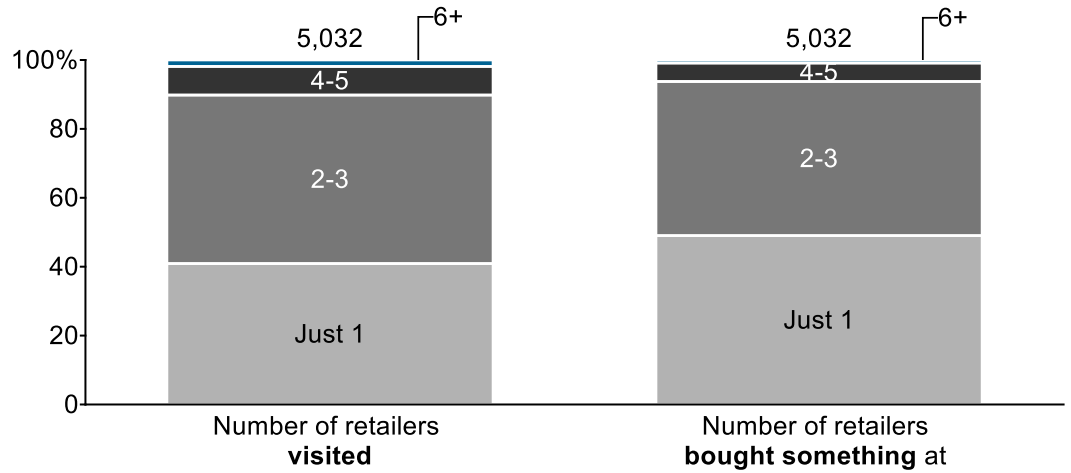
- **UK Consumers are very price focused**

Shopping criteria for shopping at a specific retailer
(mentioned as top 3 criteria)

- **... and shop around to save money**

- **Q: How many different grocers do you typically tend to visit / actually buy something at (in the same trip)?**

Average number of retailers shoppers use to browse/shop at (in-store):



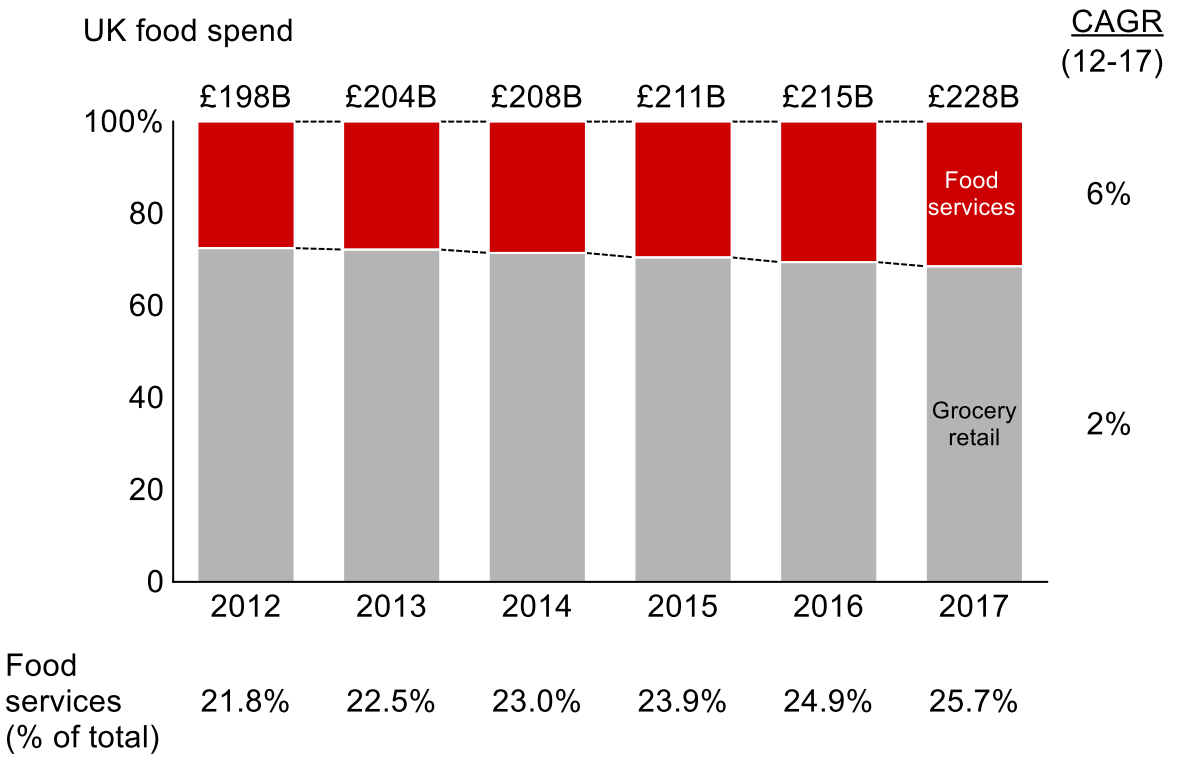
	Number of retailers **visited**	Number of retailers **bought something** at
Weighted average	2.1	1.9

- Most common reason for stated in-store shopping preference was **"saves money"**

- Source: UK grocery consumer survey 2018 (N=5,032); American Journal of Clinical Nutrition, 2015

Food system: Faster growth of food services, which tend to serve higher calorie products vs. retail alternatives, contributes to poor health outcomes

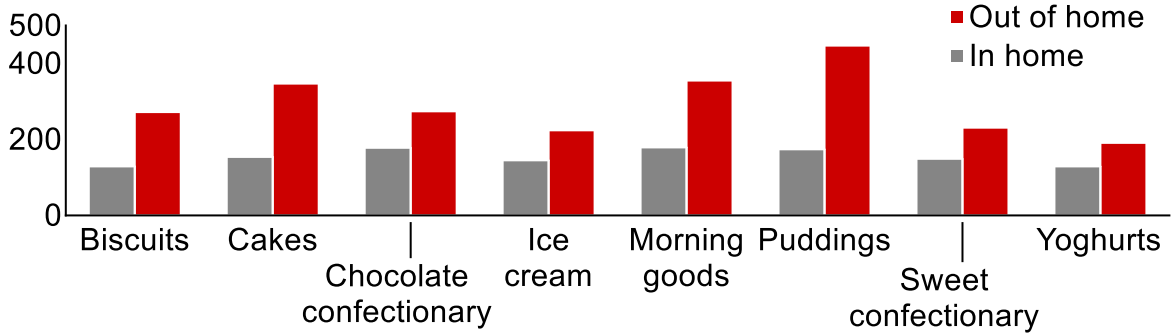
Food services is becoming an increasingly important source of our food



	2012	2013	2014	2015	2016	2017
Food services (% of total)	21.8%	22.5%	23.0%	23.9%	24.9%	25.7%

Food served out of home tends to have higher calorie content, and eating out has been linked to higher risk of obesity

Average calorie content per portion (weighted by volume of product sold in GB)



"Based on the analyses undertaken, sales weighted average **calories per portion are higher in the eating out of home sector than for retailers and manufacturers for all product categories** where figures are available for comparison."

Public Health England, 2017

"**Eating out has been linked to a higher risk of being overweight or obese**, which increases the risk of weight-related diseases such as cardiovascular disease and diabetes."

NHS, 2014

Source: Annual Business survey, 2018 (market sizes); 'Sugar Reduction: Achieving the 20% A technical report outlining progress to date, guidelines for industry, 2015 baseline levels in key foods and next steps', Public Health England, 2017; NHS, 2014

Individual choices: People's interaction with food choices varies based on a complex set of factors

Habits, preferences, needs

- Social/ cultural norms (links to class)
- Preferences shaped in childhood
- Advertising influences
- Religious or belief-based preferences
- Health-driven needs

Knowledge

- Food/ nutrition knowledge (what is a healthy diet)
- Knowledge about the immediate effects of eating on your body
- Knowledge about the long-term impact of diet

Skills and confidence

- Cooking skills
- Shopping skills (where / how to buy healthy food)
- Confidence to try new things

Financial constraints

- Higher cost of healthier diet
- More frequent top-up buying & from more "convenience" retailers
- Bulk buying restrictions (cost/storage)
- Access to equipment
- Access to / cost of energy
- Access to / cost of transport
- Higher risk/ cost of waste
- "Scarcity mind-set"

Capacity: busy lives/ need for convenience

- Time to shop and prepare food
- Mental capacity and willpower
- Frequent small/ unplanned food purchases
- Multi-tasking whilst eating

Food choices that surround us

- Prevalence and/or prominence of food retail outlets (e.g. supermarkets, convenience stores)
- Prevalence and/or prominence of takeaway/ restaurant options
- State-provided options (school meals, hospitals, prisons, elderly care)
- In-store marketing and promotions
- What is on shelves/how is it displayed
- Options at work
- Portion size

Social relationships

- Peer influence
- Partner/ family support
- Social practices

Source: Corinna Hawkes, Glasgow Centre for Population Health seminar; expert interviews

Individual choices: 3 priority segments given current/future cost impacts and ability to make meaningful change

"Health poor"

WHO Lower income, education, and % in work than average; all ages

WHAT Diets low in healthy food (fruit/veg, fish) but also low sugar and alcohol; high red meat intake

HOW Eat alone at home, watching TV

WHY Financial constraints; food environment (more likely to be in food swamp); low food knowledge / confidence / skills; health needs (diabetes)

Overweight and obese

2x more likely to have diabetes

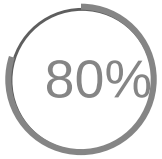
"Food rich, time poor"

WHO Married, middle-aged with high levels of education and income, and high % in work

WHAT Diets high in meat, salt and alcohol and low in fruit/veg and fish; some dieting

HOW Frequent restaurant-goers

WHY Capacity (working and time poor); income (more eating out drives unhealthy choices)



Overweight and obese

High blood pres.& hypertension

"Snack pack"

WHO Young adults who often still live at home and are in full-time education

WHAT Low-variety diets high in unhealthy sugar and salt; low in fruit/veg and protein

HOW Either out at fast food restaurants or at home watching TV

WHY Preferences (sweet tooth, food not a priority); social relationships (same as peers); financial constraints

Overweight and obese

No health conditions (young adults)

Individual choices: 'Leisurely home cooks' may be harder to impact; conversely 'kids & teens' are areas where direct action can be impactful

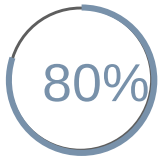
"Leisurely home cooks"

WHO Older empty-nesters, many retired; high education levels and med-high income

WHAT Varied diets high in fruit/veg and fish, but also high alcohol; meets the most Eatwell recommendations on average

HOW Eat at the table at home

WHY Health needs (high chol / blood pressure); capacity (time rich); high knowledge/skills/ confidence



Overweight and obese

High chol. & high blood pressure

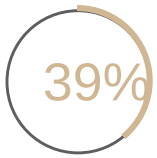
"Refuelers"

WHO Very low income people in single person households; either young adults or 75+

WHAT Diets high in sugar but low in fruit/veg and very low in protein

HOW Alone at home

WHY Financial constraints (poverty premium worse for single person hh); social relationships (food for fuel rather than social activity); low knowledge / skills / confidence



Overweight and obese

Some hypertension

"Rainbow eaters"

WHO 25-44 year-old working people with kids at home and high levels of both income and education

WHAT Healthy varied diets with high fruit/veg and fish and low sugar, but high in calories and fat

HOW At the table (very infrequently whilst watching TV)

WHY Preferences (focus on health); high knowledge / confidence / skills re what is healthy; social relationships (prioritise eating at a table with family)

Overweight

Normal blood pres. and blood sugar

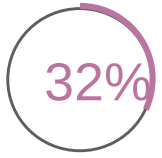
"Kids and teens"

WHO 5-17 year-old children still at home; ~34% live in poverty* vs. 22% of overall population

WHAT Unhealthy diets high in sugar and low in fruit/veg; also high in protein

HOW Very infrequently alone, at the table at home or at school (18% of calories consumed)

WHY Preferences (sweet tooth); social relationships (eat with family and peer pressure)



Overweight and obese

Normal blood pres. and blood sugar

Note: *Poverty based on measure of total resources available (net income + other available resources – debt – "inescapable family-specific costs" including housing, childcare, cost of disability, social care costs)
Source: Measuring Poverty 2019, Social Metric Commission, July 2019

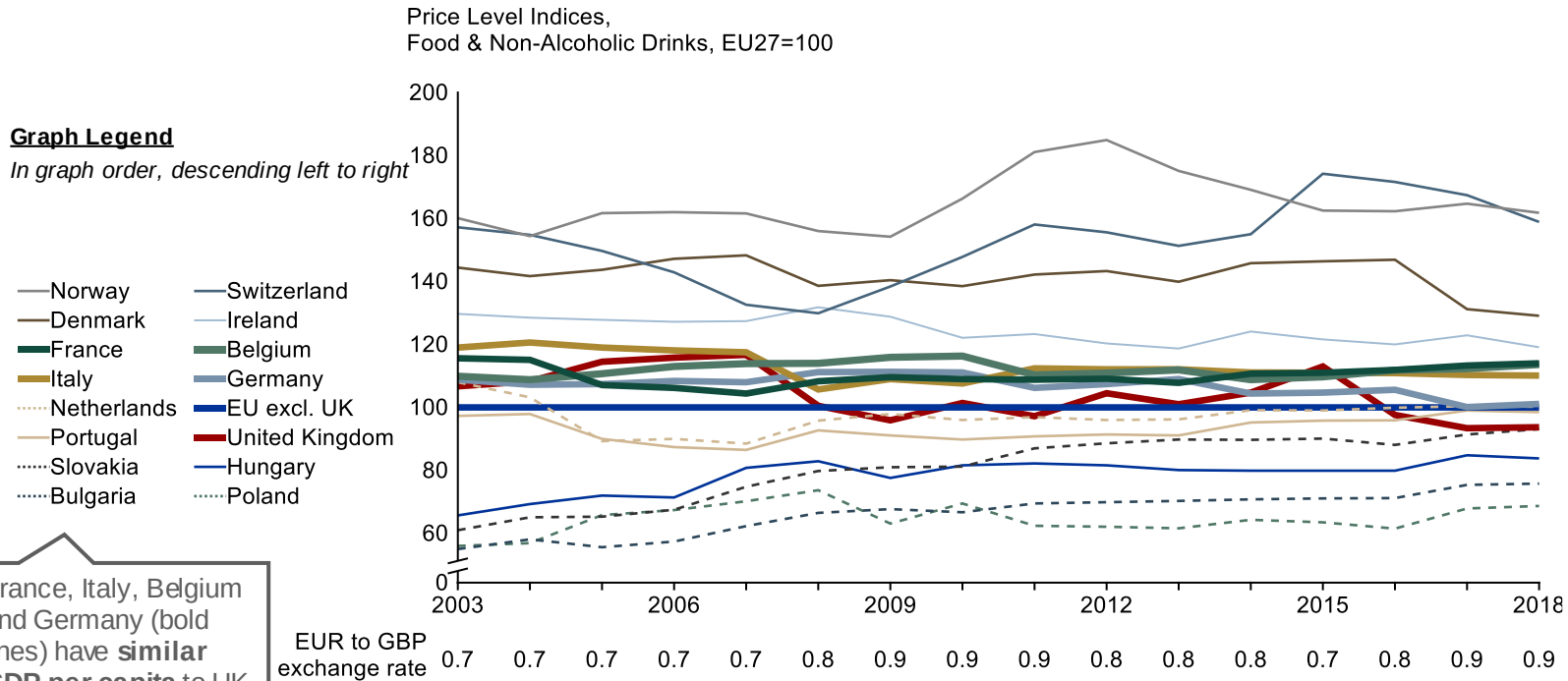
Diagnosis: point of departure

Our Food System Today

- Climate, nature and land
- Diets and health
- **Inequality**

Food prices and affordability: UK has lower food prices when compared to EU countries with similar GDP per capita

Adjusted for purchasing power, UK food prices are in line with EU average, fluctuating with FX rates



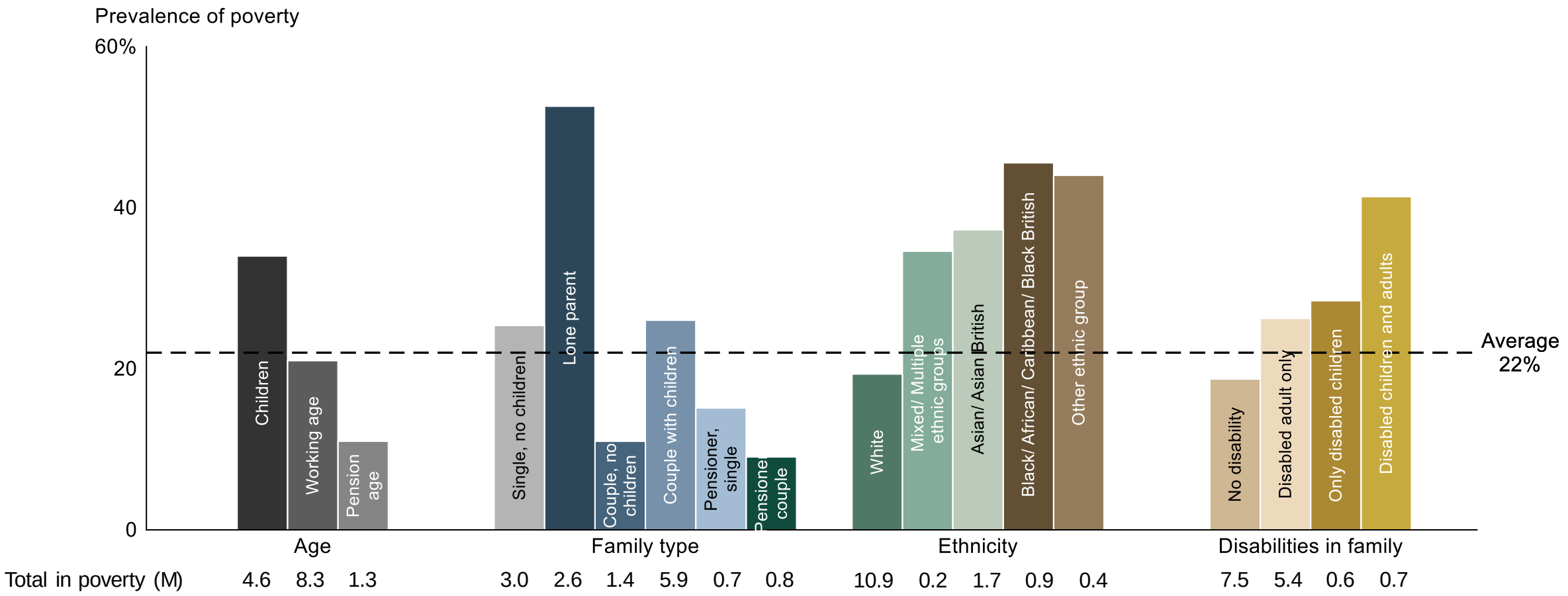
France, Italy, Belgium and Germany (bold lines) have **similar GDP per capita** to UK, all have **higher PLIs**

Yet, the UK has lower food prices than countries with similar GDP per capita

Country	GDP per capita 2018 ($K)	PLI, Food & Drink 2018
EU	36	100
UK	43	94
Germany	48	101
Belgium	47	114
France	43	114
Italy	34	110

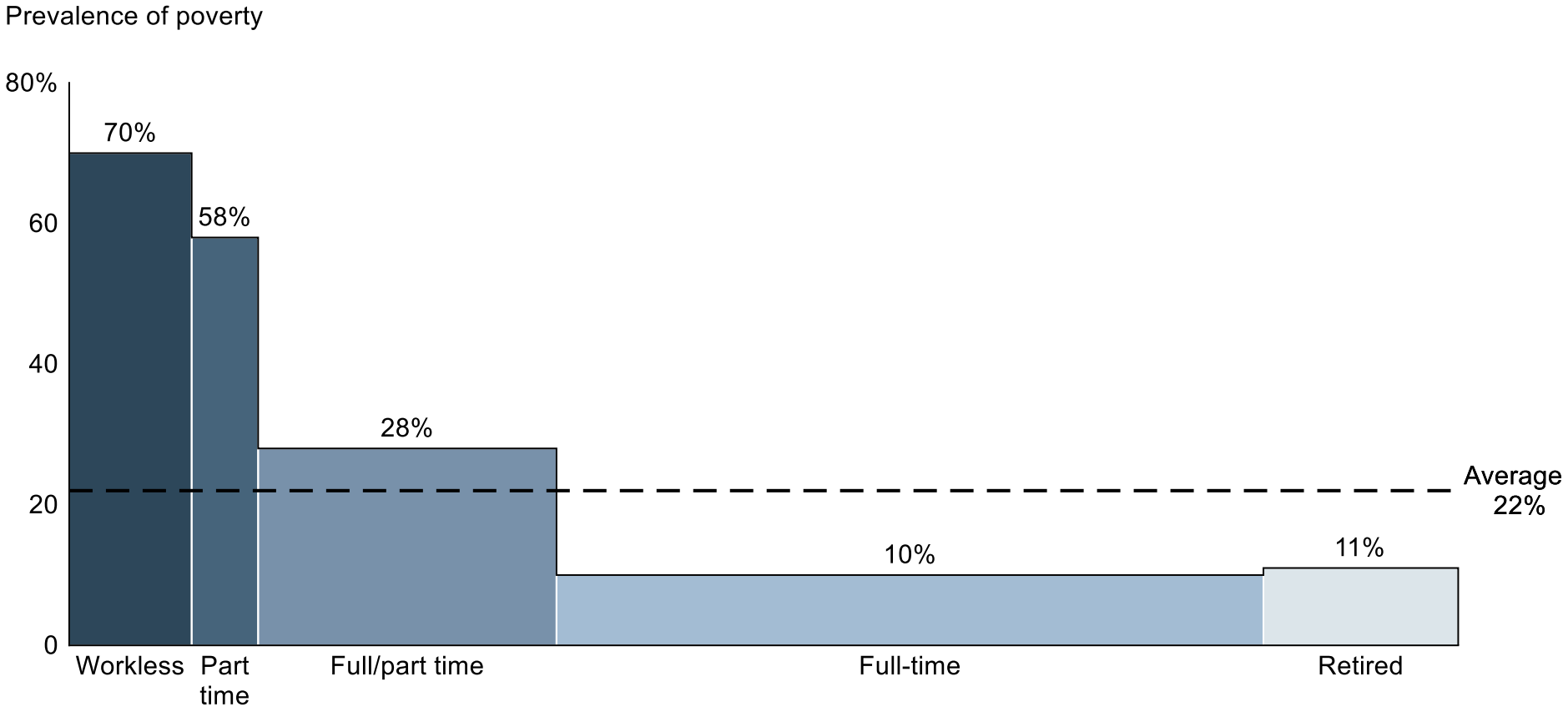
Note: Price level indices (PLIs) are presented as the ratio of purchasing power parities to exchange rates, they provide a measure of the differences in price levels between countries by indicating for a given product group the number of units of common currency needed to buy the same volume of the product group or aggregate in each country; Price level indices (PLIs) provide a comparison of the countries' price levels relative to the European Union average: if the price level index is higher than 100, the country concerned is relatively expensive compared to the EU average, while if the price level index is lower than 100, then the country is relatively cheap compared to the EU average; EU average PLI is calculated as the weighted average of the national PLIs, weighted with expenditures from national accounts, corrected for price level differences for the; EU average aggregate for 27 EU member states, excluding UK; Top 22 EU countries shown in terms of population size; PLIs do not apply to food & non-alcoholic drinks in restaurants; GDP per capita shown in current US$ prices; Source: Eurostat-OECD; Euromonitor

Poverty: Poverty in general causes food insecurity; ~22% of the UK are in poverty with stark differences in the incidence of poverty across different groups



Source: Measuring Poverty 2019, Social Metrics Commission, 2019

Poverty: Full-time work and full/part-time work families make up 51% of those in poverty

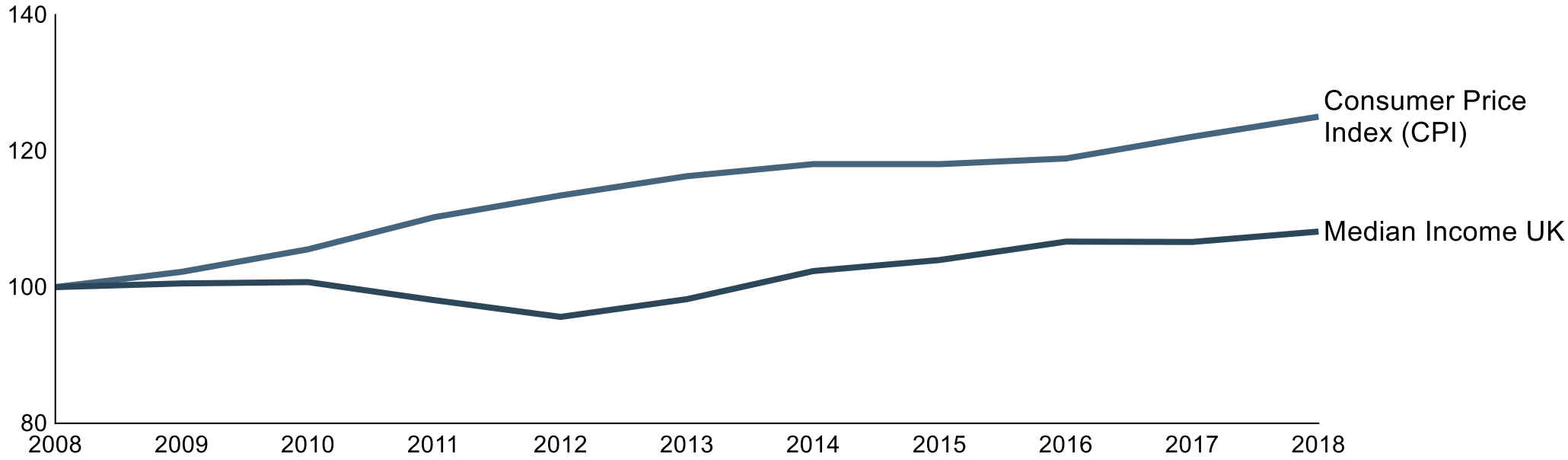


Total in poverty (M)	4.0	1.8	3.9	3.3	1.0
Total in group (M)	5.7	3.1	13.9	33.0	9.1

Source: Measuring Poverty 2019, Social Metrics Commission, 2019

Food prices and affordability: Overall prices rose faster than income over last 10 years, exacerbating food insecurity as pressures on household budgets mount

UK weekly income and price index (2008=100)



Source: ONS data

Food prices and affordability: in theory, cost is not likely to be the sole driver of unhealthy eating at lower income deciles

Cost per calorie

- Total cost of a food divided by the caloric value contained within it
- Healthy foods are typically less dense in energy and therefore have high cost per calorie; unhealthy foods are very energy dense, so are low cost per calorie
- This is the most commonly used metric in nutrition and development economics

Cost per gram

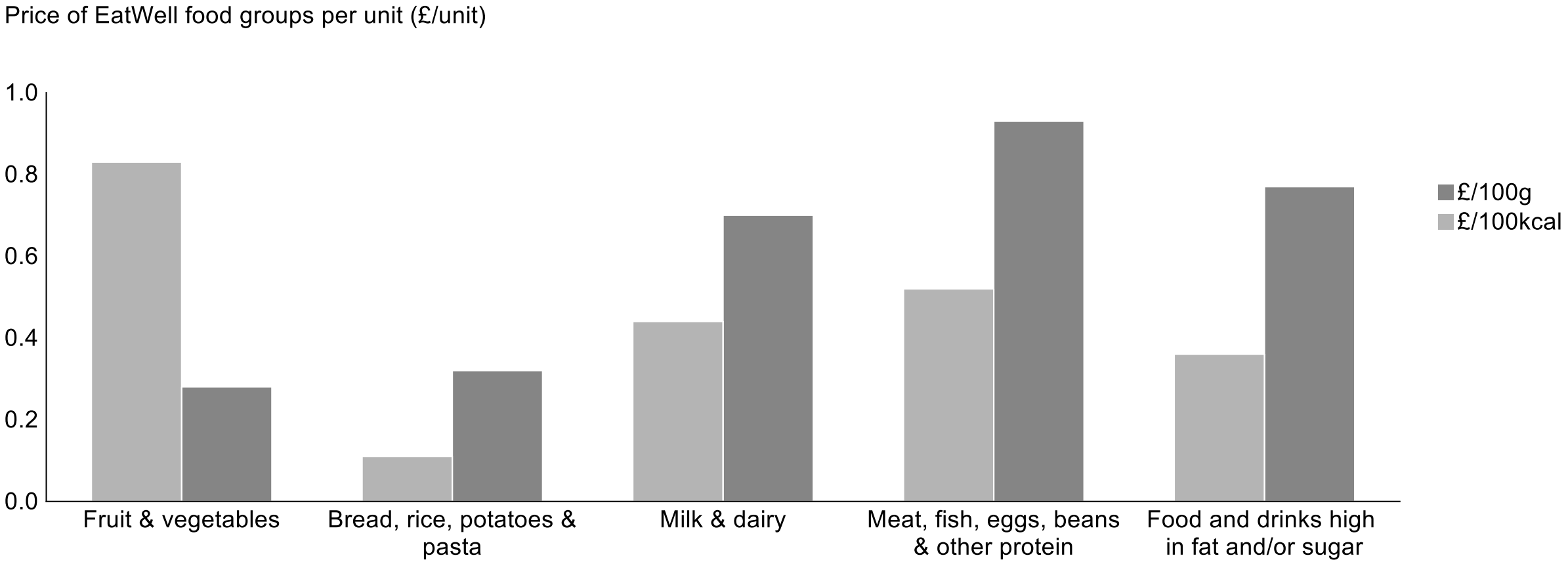
- Total cost of food divided by the weight of the food
- More aligned with how food is eaten in real life – to satisfy hunger rather than fulfilling calorie intake
- When the government defines portions, it usually does so by weight

Calories held constant or reduced

- When assessing the cost of a population changing to a healthier diet, there are two possible approaches:
  - Keep the current energy intake constant and vary the components that make up the total – this tends to lead to high estimates of the cost of healthier diets
  - Assume the calorie intake to drop to the recommended amount (2,250 calories per day) since when eating healthier foods, a less calorific intake would be expected

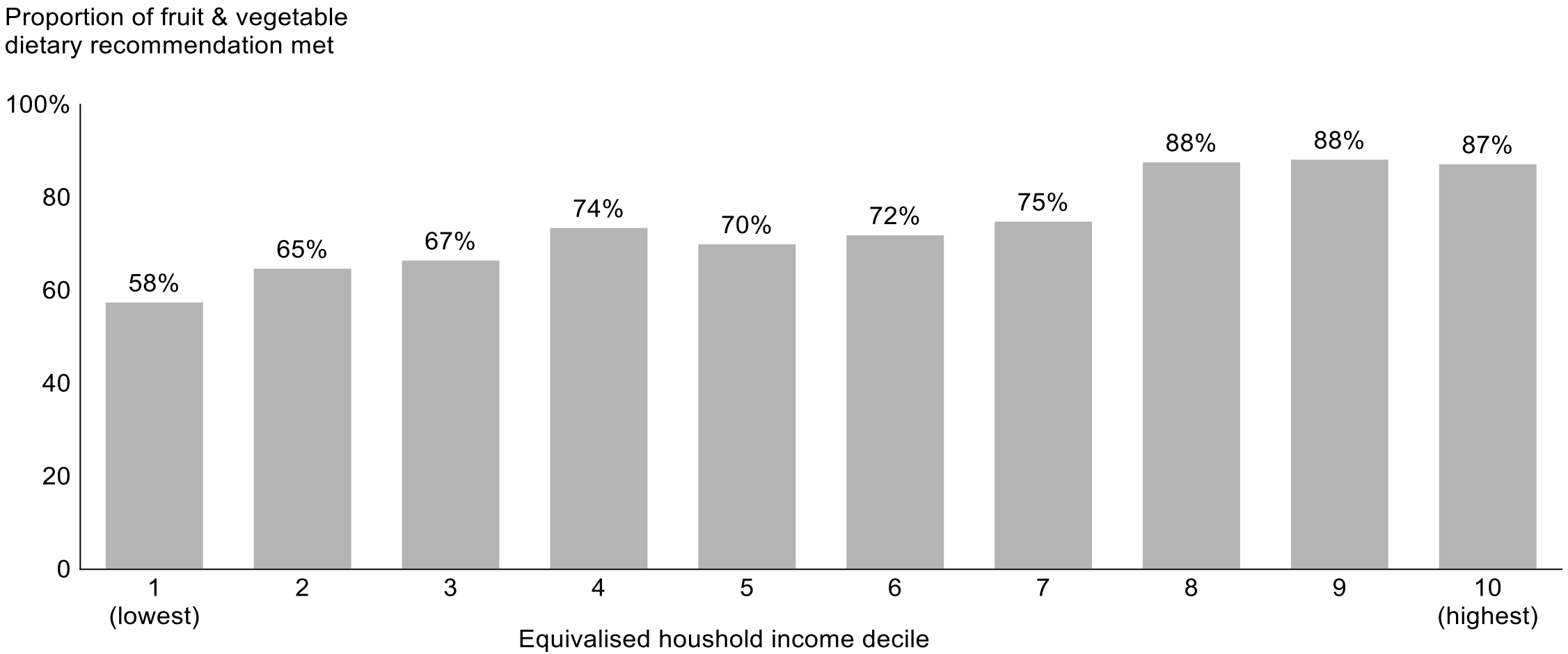
Source: "Are Healthy foods Really More Expensive?", Andrea Carlson & Elizabeth Frazao, United States Department for Agriculture, 2012; "Cheap as Chips", Christopher Snowdon, Institute for Economic Affairs, 2017; "Comparing Prices for Food and Diet Research: The Metric Matters", NRV Jones, 2016

Food prices and affordability: Depending on the method, the cost of different food groups varies considerably (fruit & veg cheaper on a £/gram than £/kcal basis)



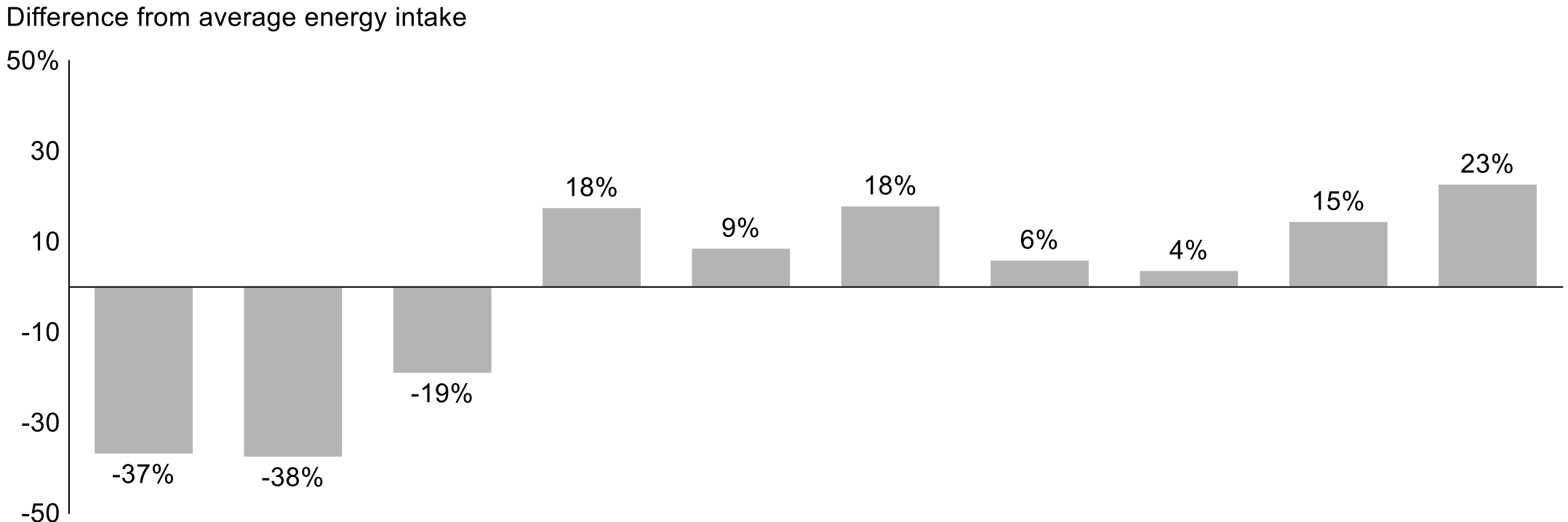
Source: "Comparing Prices for Food and Diet Research: The Metric Matters", NRV Jones, 2016; Similar finding for US food groupings found in "Are Healthy foods Really More Expensive?", Andrea Carlson & Elizabeth Frazao, United States Department for Agriculture, 2012

Income and diet: in practice, lower income deciles consume less fruits and vegetables



Note: Meeting recommendations according to the Eatwell guide, there is a believed underreporting in the NDNS ~25% of kcal, here the consumption appears as reported
Source: NDNS survey; UK Eatwell Guide

Income and diet: The poorest 20% of people report consuming significantly fewer calories than average



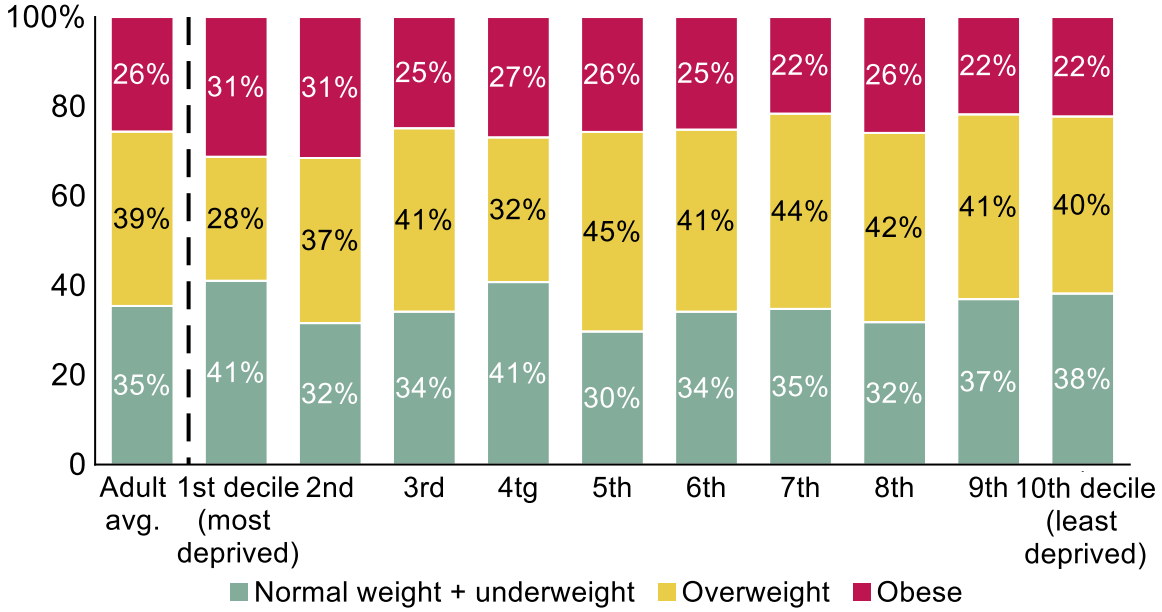
	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
Obesity prevalence	31%	31%	25%	27%	26%	25%	22%	26%	22%	22%

Note: NDNS survey respondents known to underreport calorie intake by ~25% on average
Source: NDNS survey

Income and health outcomes: lower income deciles have worse health outcomes, particularly in terms of obesity in children and severe obesity in adults

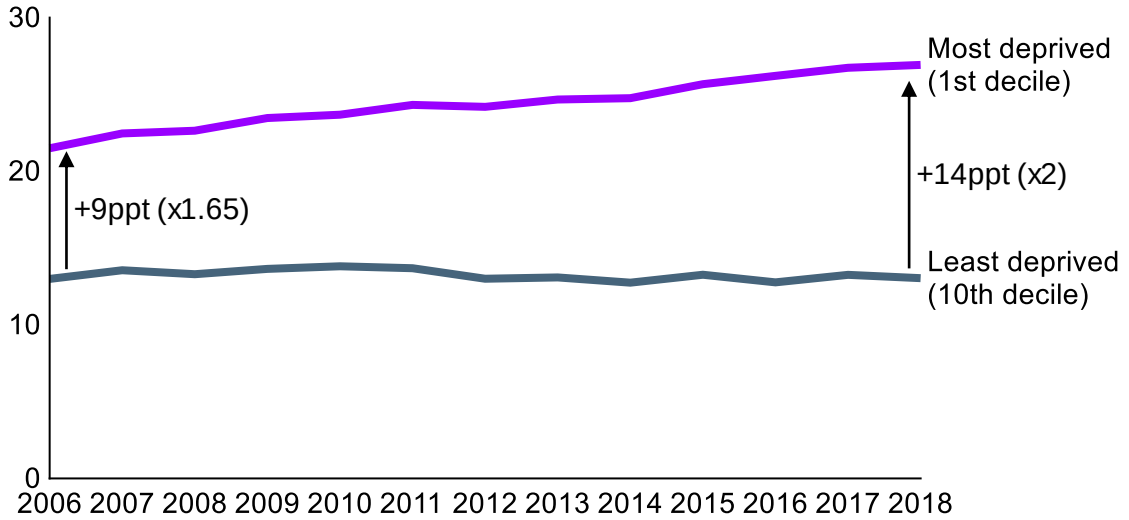
~65% of the adult population overweight/obese – rates spread broadly across the socioeconomic spectrum

BMI* by equivalised income** decile
(adults in England, 2015-2017)



Children: more vulnerable to inequality than adults with growing likelihood of obesity among most deprived

Obesity prevalence amongst Year 6 children
by Index of Multiple Deprivation (%)

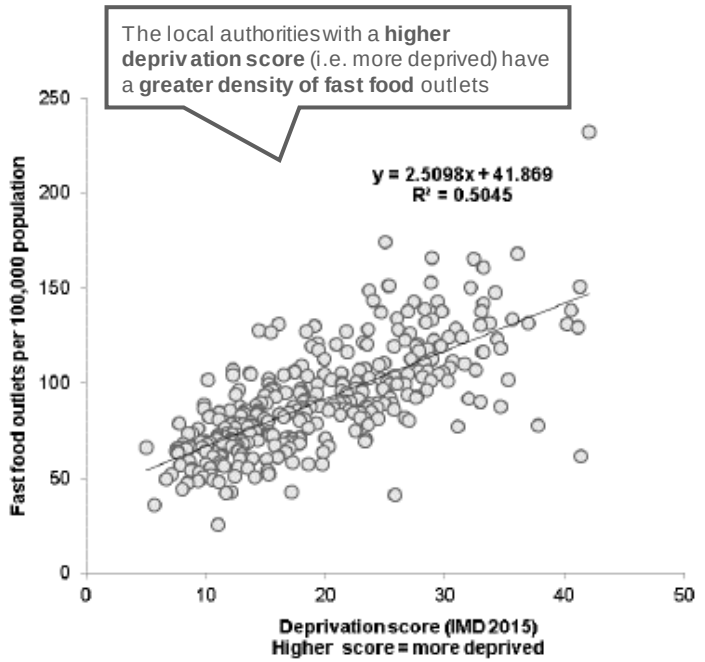


Note: *BMI: Body Mass Index; Adults: Obesity (BMI>=30kg/m2), Overweight (25<BMI<30), Underweight (BMI<18.5) Children: obese was defined as >95th UK National BMI percentile established by the cross sectional stature and weight reference curves for the UK, 1990 ; **Equivalised income normalises household income for all types of households to that of a married couple (using McClements scale); Adult population includes population aged >=18 for the NDNS survey years 7,8 and 9; NDNS data used instead of Heath Survey for England for adults as HSE only gives BMI by income quintiles; Children data from year 6 (age d 10-11) from the National Children Measurement Plan, using NCMP data as NDNS does not include Deprivation Index; Index of Multiple Deprivation accounts for income inequality but also for skills & education inequality, crime among other variables
Source: NDNS database year 7 (2014/2015), year 8 (2015/2016) and year 9 (2016/2017), National Children Measurement Plan trend data for Year 6 children (aged 10-11) from 2006/2007 to 2018/2019

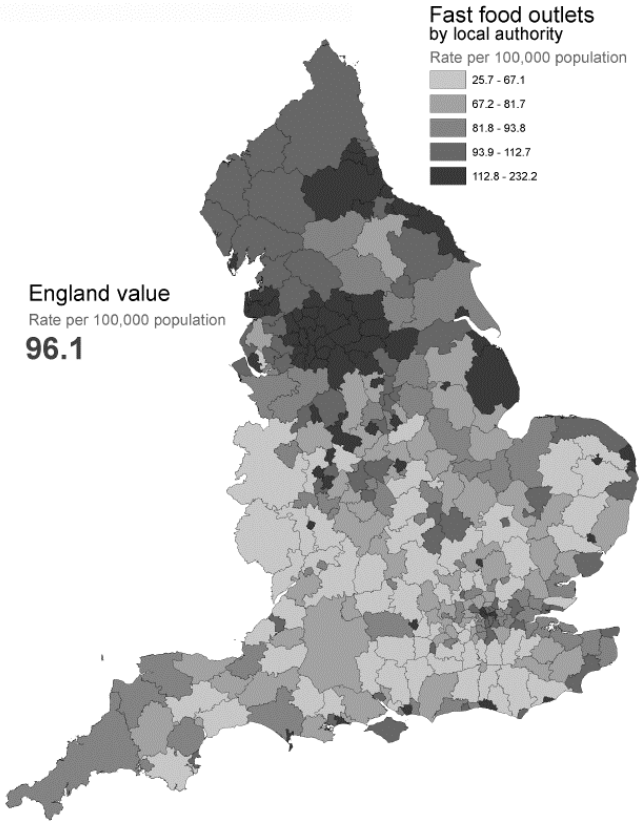
Additional barriers to healthy choices: deprived areas have greater density of fast food outlets

Deprivation is linked to availability of fast food restaurants…

Relationship between density of fast food outlets and deprivation by local authority

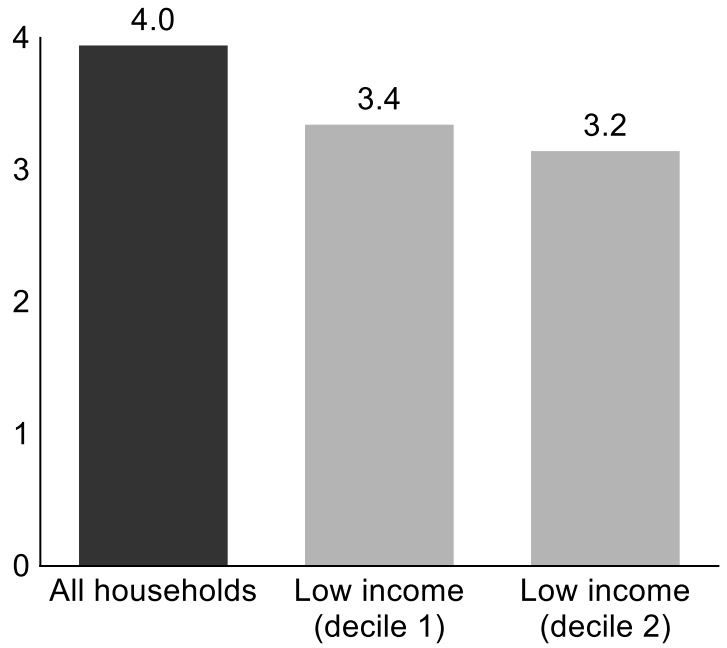


…which greatly varies across England



Deprivation and local food environment affect food choice

Fruit and veg intake by eq. household income (in mean 5 a day portions purchased, 2015)

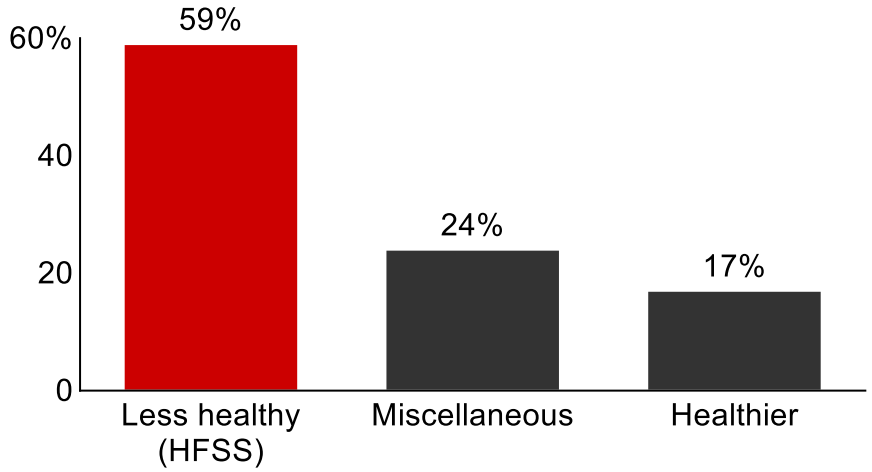


Note: 'Fast food' refers to energy dense food that is available quickly, including but not limited to burger bars, kebab and chicken shops, chip shops and pizza outlets
Source: Obesity and the Environment – Density of fast food outlets at 31/12/2017, Public Health England; Diet adult slide set 2017, Public Health England

Additional barriers to healthy choices: Advertisements disproportionately on unhealthy foods; low-income households more likely to see adverts

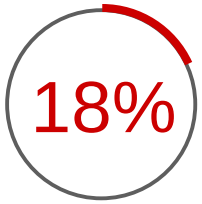
Less-healthy food adverts much more heavily advertised than healthier foods

TV food adverts during family viewing time (Feb 2017)



- Products classified by Obesity Health Alliance based on overall nutritional content of products shown, using the government's Nutrient Profile Model*

For retailers, non-perishable foods perform best in promotions as consumers bulk-buy



Vs.

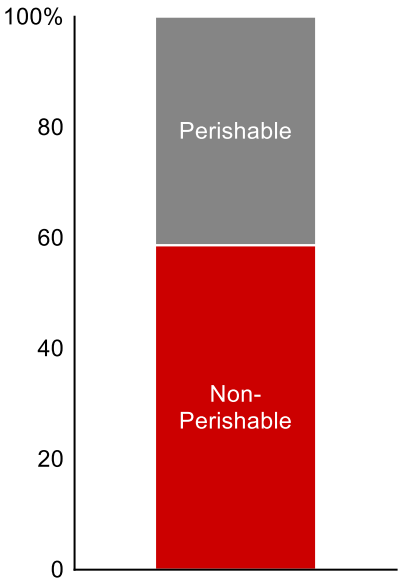
Of **perishable product** promotions made **positive returns** in 2016

Of **ambient / non-perishable product** promotions made **positive returns** in 2016

- Cambridge University researchers found sales uplift from promotions to be higher for unhealthy products as consumers take opportunity to **stockpile non-perishable products**

~60% of grocery foods are non-perishable

Type of food product sold in UK Retailers, 2019 (%)



Note: *'Less healthy' indicates the product advertised would be rated as HFSS by the nutrient profile model; 'Miscellaneous' indicates the advert was not suitable for nutrient profiling (e.g. generic supermarket adverts); Perishable / Non-perishable products based on Nielsen data where food categories marked as "Ambient", "Frozen", or necessarily non-perishable (e.g. alcohol, chewing gum, couscous) deemed to be non-perishable
Source: Obesity Health Alliance, 2017; North America Manufacturing Benchmarks, MPI Group, 2007; Trade Promotion performance, Nielsen, 2016; American Journal of Clinical Nutrition, 2015; GB sales by product, Nielsen, 2019

Additional barriers to healthy choices: homemade food requires more preparation time and energy - as well as additional equipment and expertise

Cost to purchase is not the only important factor

- When comparing generally healthier, homemade food with more processed food, there are a number of important considerations other than cost to purchase:
  - Cost of energy
  - Calorific value
  - Preparation time
  - Expertise
  - Equipment

TESCO

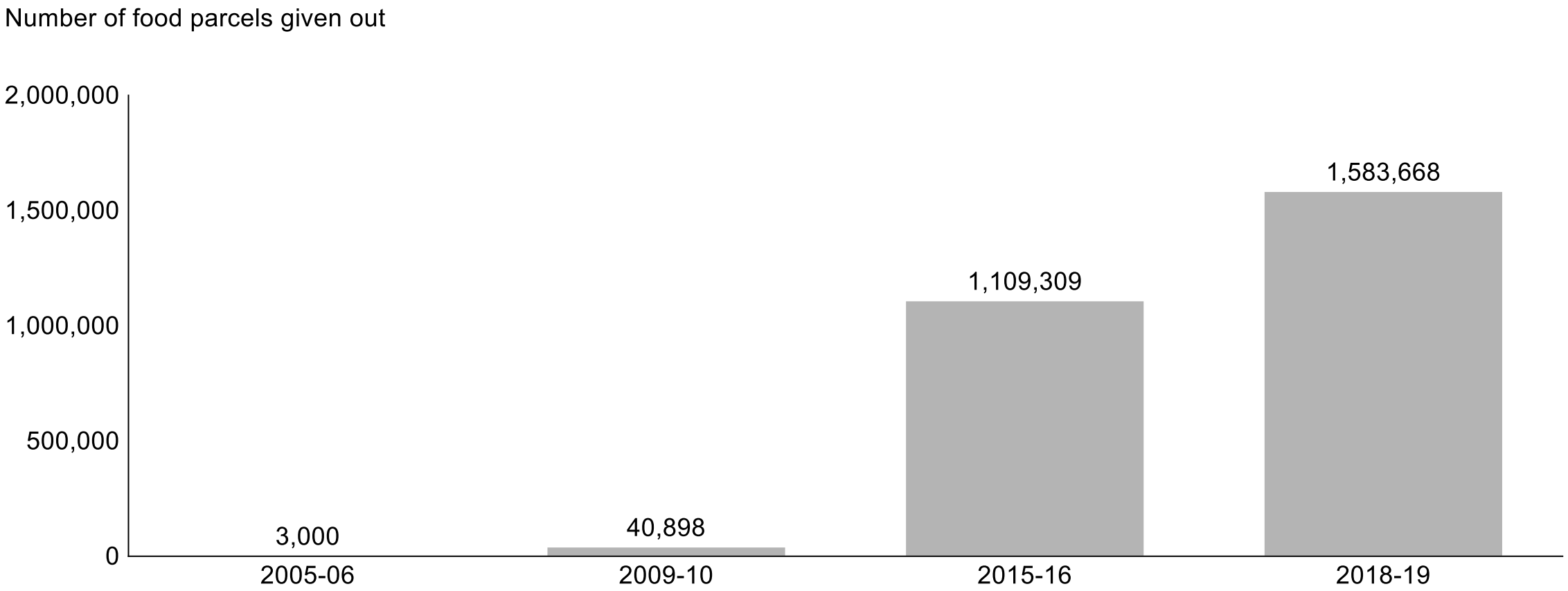
BBC goodfood

Comparing a Tesco ready meal with a homemade recipe

	Ready meal	Homemade
Cost (per 450g)	£2.50	£0.73
Preparation time (mins)	7.5	75
Energy (kcal)	367	483
Energy cost	£0.06	£0.13

Note: Calculated from the total weight of the ingredients. Does not factor in reduction from cooking. Energy cost from typical cost of a microwave ready meal vs. equivalent in an electric hob.
Source: Tesco Shepherd's Pie, Tesco, 2019; No-fuss shepherd's pie, BBC GoodFood, 2019; Confused about energy, 2017

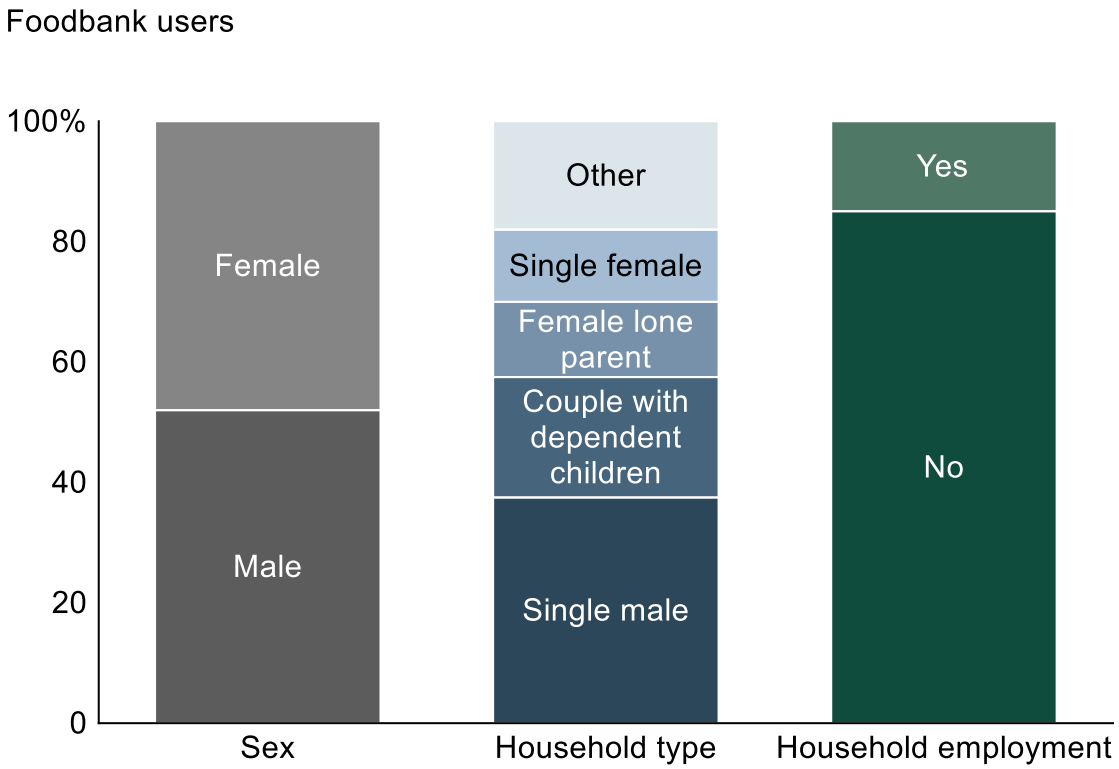
Acute problems growing: 500x more food bank parcels given out in 2018-19 than in 2005-06



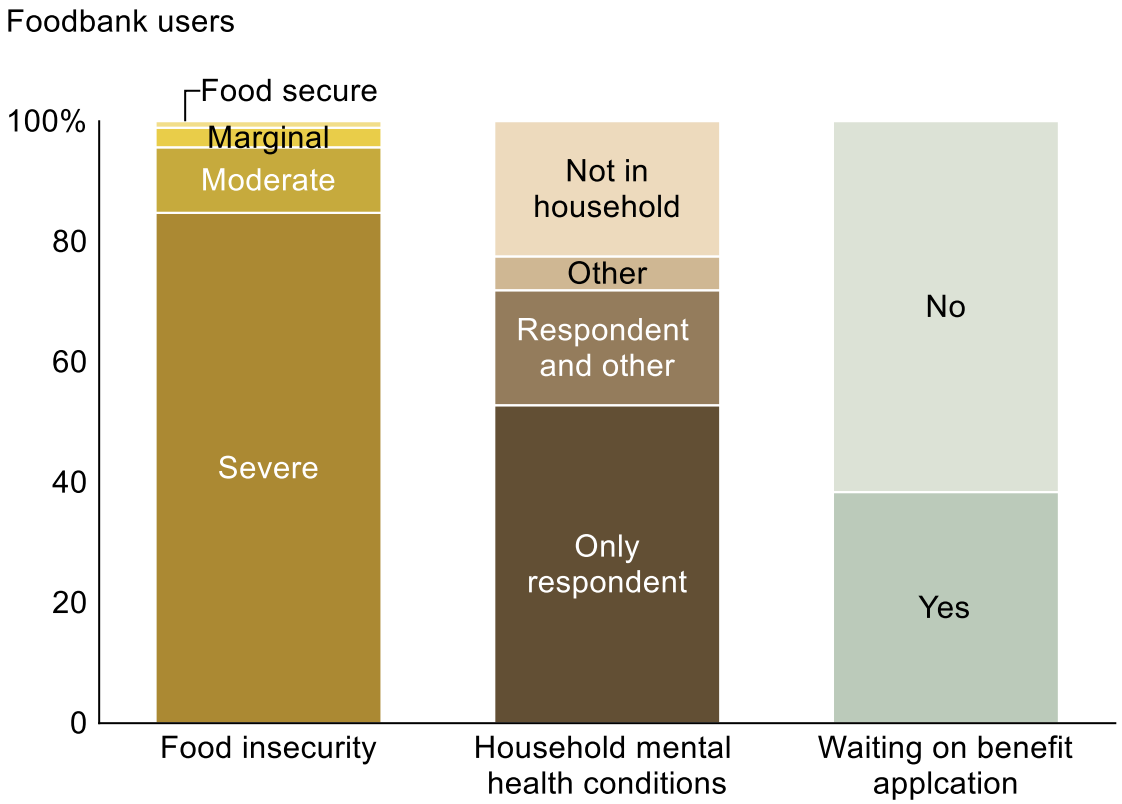
Source: Family Matters Institute, 2017; The Trussell Trust, 2019

Acute problems growing: Who is using food banks, and why?

Who uses food banks?



Why do people use food banks?



Notes: Missing responses have been ignored
Source: Financial insecurity, food insecurity, and disability", The Trussell Trust, 2017

The food system is critically important to the UK, economically and culturally

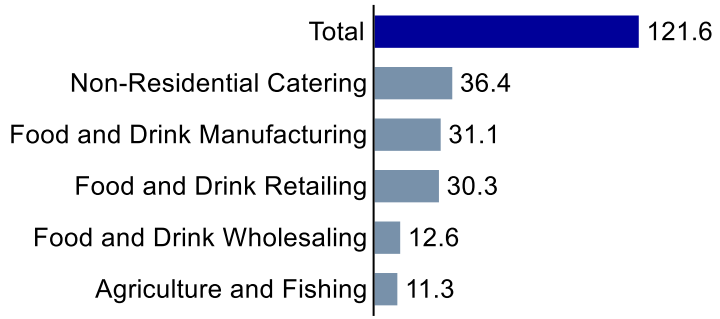
UK food system contributes significantly to the economy and employment…

£122B
The agri-food sector contribution to national GVA in 2017; 7% of national GVA

4.1M
People employed in the agri-food sector in Q4 2018; 1 in 7 jobs

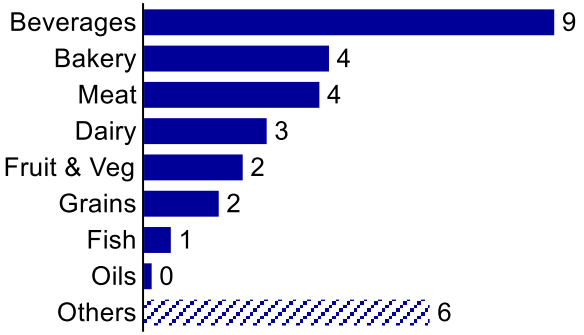
£22B
The value of food and drink exports in 2017

GVA of the UK agri-food sector 2017 (£B)

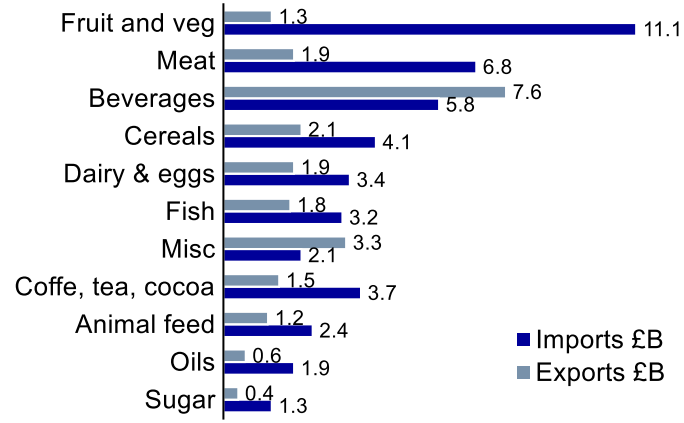


…provides a wide variety of food, from the UK and abroad…

UK Food and drink manufacturing by product type GVA of sector, 2017 (£B)

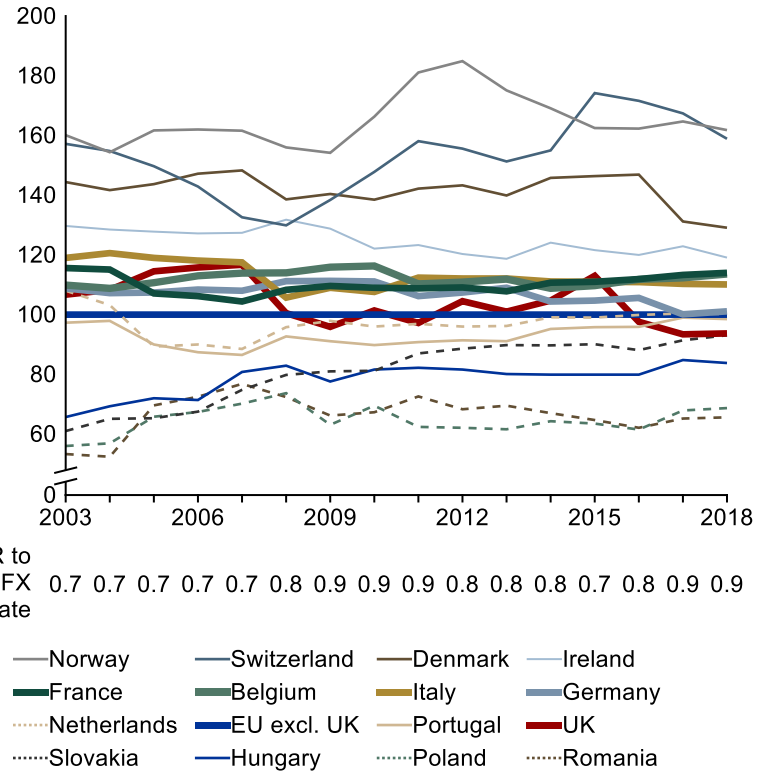


UK trade in different food groups, 2018 (£B)



…which is available to consumers at prices in line with EU average

Price Level Indices, Food & Non-Alcoholic Drinks, EU27=100



Note: Price level indices (PLIs) are presented as the ratio of purchasing power parities to exchange rates, they provide a measure of the differences in price levels between countries by indicating for a given product group the number of units of common currency needed to buy the same volume of the product group or aggregate in each country
Source: Food Statistics Pocketbook, Defra, 2019; Eurostat-OECD; Euromonitor

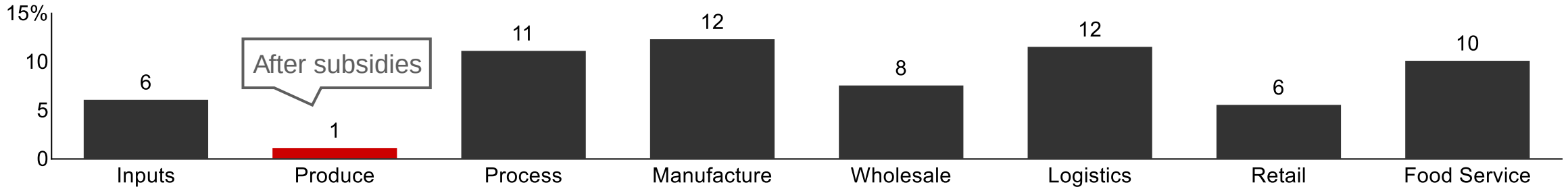
Overview: Our Food and Drink system is a complex mix of industries

	Input	Produce	Process (1st order)	Manufacture	Wholesale	Transport	Sell (Retail)	Sell (Food services)
Role	• Produce and sell agricultural inputs (fertilizers, pesticides, seeds, animal feed)	• Own and run the commodity production process	• Process raw ingredients from farms for inputs to manufacturers	• Manufacture food from inputs from farms and processors	• Sell food to food services, retailers (mostly convenience and small retailers)	• Deliver product and carry manufacturer brand and private label, warehousing services	• Sell food to end consumers (e.g. via supermarkets, convenience stores, discounters, online)	• Prepare and serve food to end consumers (e.g. via restaurants, bars, cafes)
Businesses (#)	• ~2K	• ~220K	• ~2K	• ~8K	• ~16K	• ~21K	• ~56K	• ~135K
Revenues*	• £9B	• £32B	• £33B	• £59B	• £103B	• £10B	• £156B	• £72B
Market structure / key dynamics	• Markets for fertilizer and pesticides are concentrated, with top 5 players accounting for ~30% of revenues	• Highly fragmented across produce type • The vast majority of farms are small-scale family farms • Some cooperatives, with top 5 farms accounting for ~15% of revenues	• Concentrated segment, top 5 players account for ~25% of revenues – E.g. top 9 dairy processors process 80% of milk • Some have direct relationships with retail/food service firms particularly for low-value-added goods – E.g., Cargill sells eggs direct to McDonald's	• Large branded companies enjoy high market shares – E.g. in snacks, top 5 players account for ~40% of the market – E.g. in soft drinks top 5 account for ~55% • Private label growing, driven by rise of discounters in retail segment	• Top 5 companies account for ~15% of revenues • Traditional lines between manufacturing, wholesale and retail are eroding (e.g. Tesco/Booker merger) & wholesale increasingly bypassed	• 13 3rd party logistics (3PL) providers supplying the large UK retailers - Key players distribute range of goods, not just food - All have different mix and offerings (ambient, frozen, etc) • Service and asset-based offering, allowing retailers and manufacturers to keep these assets out of their finances	• Big 4 supermarkets account for ~70% of sales, but are losing share to discounters (currently at 12%) • Price competition intensified by growth of discounters • Increasingly owning production (own label) and wholesale activities	• Food services gaining share of overall consumer food spend; growth driven by delivery services segment (growing at ~15% p.a.) • Fierce competition on the high street • Rising competition from retail (e.g. Waitrose cafes)

Note: *Annual revenues (2017) earned by UK companies/ UK subsidiaries of global companies operating in the UK; This is a simplified visual showing typical flow of food products

Overview: Returns on capital employed (ROCE) vary widely between and within segments in UK value chain; farmers on average see lowest returns

Aggregate Return on Capital Employed, 2017 (ROCE)

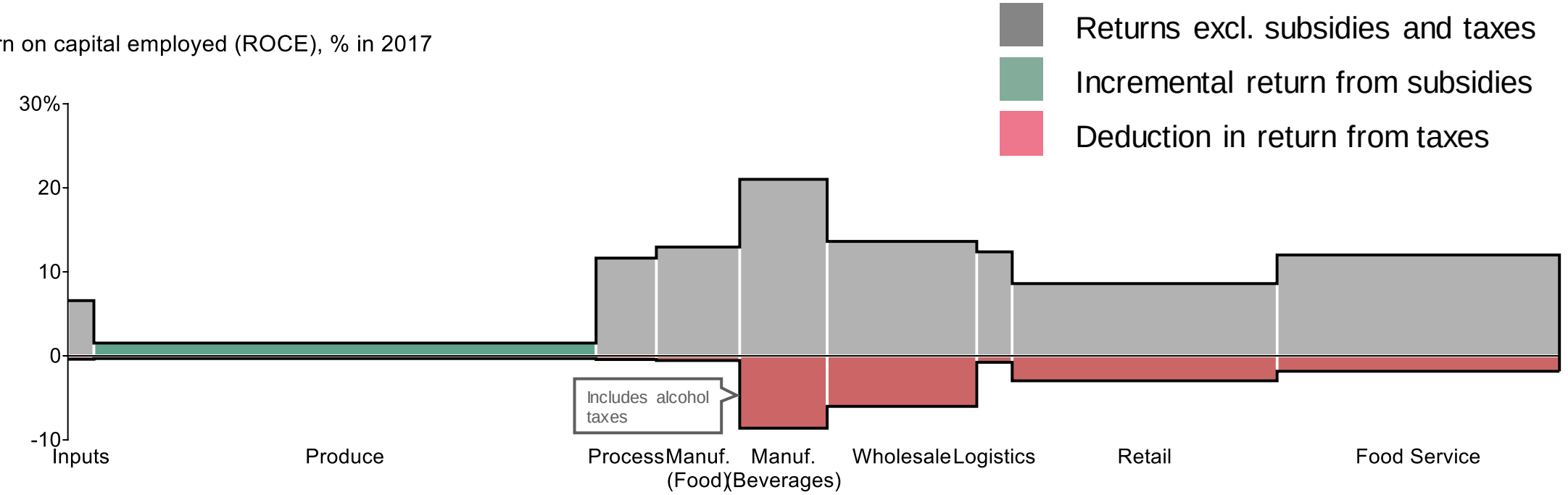


	Inputs	Produce	Process	Manufacture	Wholesale	Logistics	Retail	Food Service
Revenue, (2017, £B)	9	32	33	59	103	10	156	72
Key players ROCE snapshot (2017-18)	• Syngenta UK: 32% • Origin UK: 23% • Yara: 23% • Nufarm: 4% • Devenish Nutrition: -2%	• Very large farms: 2.6% • Large farms: 1.5% • Medium farms: 0.7% • Small farms: 0.2% • Part-time farms: -0.1%	• Tate & Lyle: 16% • Olam UK: 11% • Cranswick: 10% • Cargill: 4% • Tulip: -20%	• Coca-Cola: 38% • Greencore: 25% • Mars: 20% • Diageo: 7% • Kellogs: 2%	• Bookers: 26% • Dhamecha: 16% • Bestway: 5% • Lineage Yearsley: -5% • Blakemore: -14%	• DHL: 14% • Eddie Stobart: 7% • Reed Boardall: 1% • Lineage Yearsley: -5%	• Tesco's: 11% • Lidl: 11.% • Aldi: 9% • Sainsbury's: 8.5% • Morrison's: 8% • Asda: 4% • McColl: 4%	• McDonalds: 26% • Compass: 25% • Sodexo: 18% • Greggs: 14% • Greene King: 8.5% • Nando's: 3%

Note: Produce ROCE is for England; Company ROCEs are 2018 unless only 2017 available; Overall ROCE %s for Inputs, Process, Wholesale, Logistics, Retail and Food Service sectors are based on CIQ database of ~2,000 companies; Manufacturing sector ROCE is from OC&C report; Key player ROCEs calculated from Companies House Report and Financial Statements for UK business, based on Operating Profit after adjusting for exceptional items
Source: Company Annual Reports, Companies House; OC&C and The Grocer Top 150, 2018; Capital IQ; Annual Business Survey, ONS, 2017; Agriculture in the UK 2018

Farmers' Profits: Economic benefits are unevenly distributed, with farmers seeing the lowest return on capital employed (ROCE)

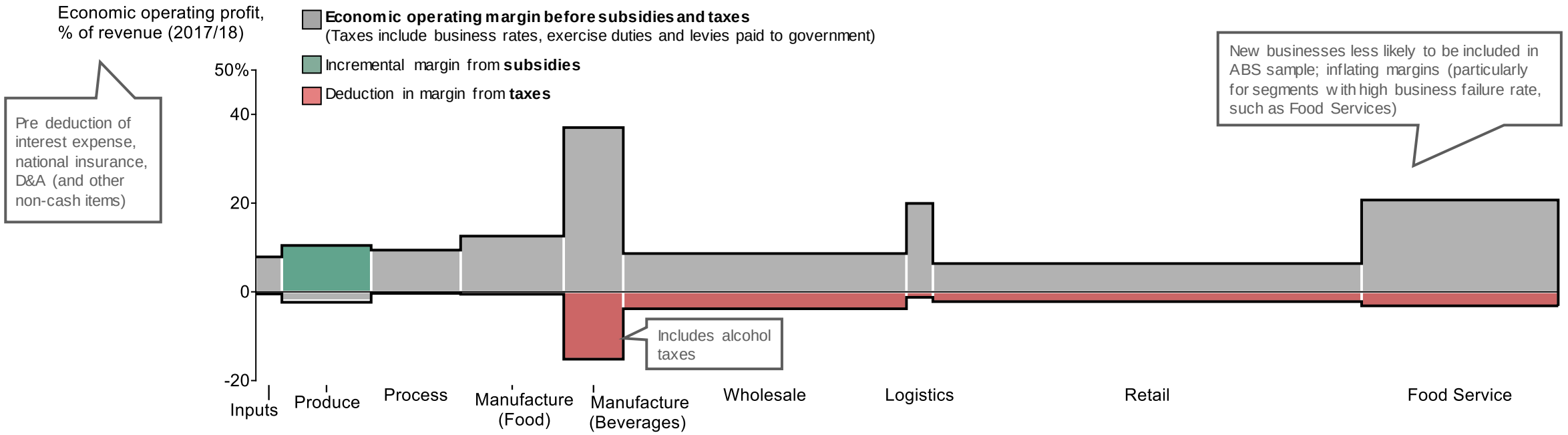
Aggregate return on capital employed (ROCE), % in 2017



	Inputs	Produce	Process	Manuf. (Food)	Manuf. (Beverages)	Wholesale	Logistics	Retail	Food Service
Capital employed (£B)	11	219	26	36	38	65	15	116	123
# Businesses (K)	2	220	2	6	2	16	17	56	135
Business failure rate	8%	3%	9%	9%	9%	10%	17%	10%	14%

Note: Produce ROCE is for England; Company ROCEs are 2018 unless only 2017 available; Overall ROCE %s for Inputs, Process, Wholesale, Logistics, Retail and Food Service sectors are based on CIQ database of ~2,000 companies; Manufacturing sector ROCE is from OC&C report; Key player ROCEs calculated from Companies House Report and Financial Statements for UK business, based on Operating Profit after adjusting for exceptional items
Source: Company Annual Reports, Companies House; OC&C and The Grocer Top 150, 2018; Capital IQ; Annual Business Survey, ONS, 2017; Agriculture in the UK 2018

Farmers' profits: Farmers on aggregate rely on subsidies to generate positive returns

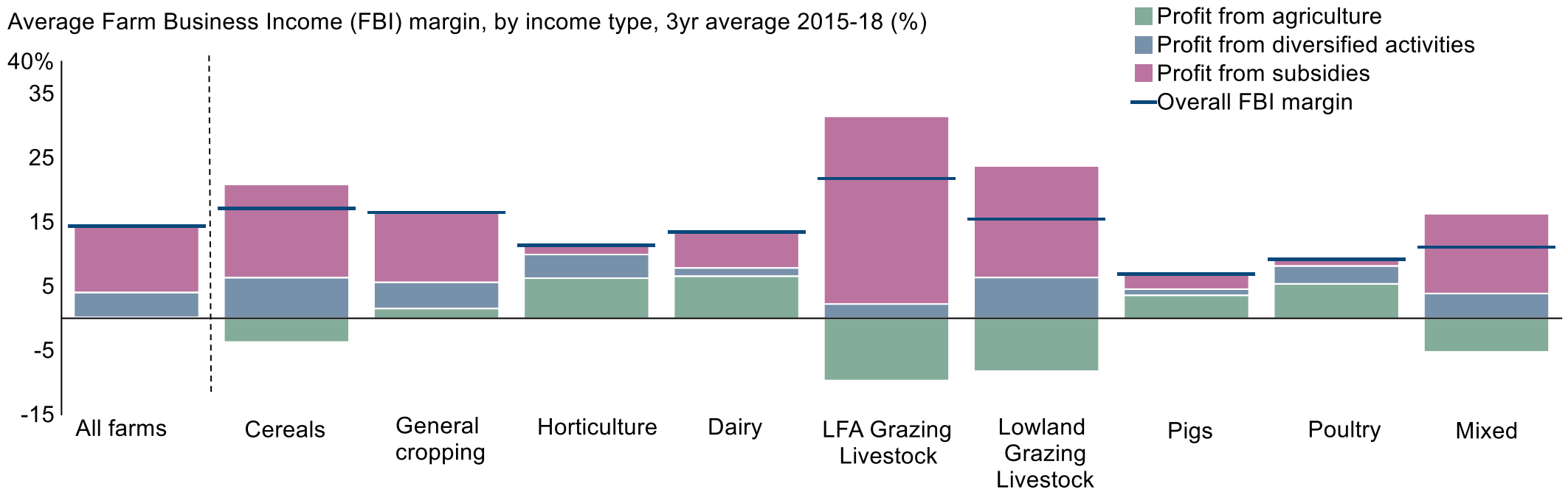


	Inputs	Produce	Process	Manufacture (Food)	Manufacture (Beverages)	Wholesale	Logistics	Retail	Food Service
Revenue (£B)	9	32	33	38	22	103	10	156	72
# Businesses (K)	2	220	2	6	2	16	17	56	135
Business failiure rate (%)	8%	3%	9%	9%	9%	10%	17%	10%	14%

Note: Bar widths reflect segment revenues (excl. VAT); For segment other than 'Produce', economic profit margin calculated from ABS data as: Total turnover – (Employee cost + Total purchases + Taxes + Inventory decrease); ABS data does not include interest and D&A cost as not available; Taxes include business rates, exercise duties and levies paid to government, but VAT, corporation tax, capital gain tax, capital allowance and water rates are not included; Produce margin represents aggregate of Farmers and Fisheries, Farmers' profit margin calculated as (Output at market prices + Total subsidies on product) – (Compensation of paid employees + Rent + Intermediate consumption + Total consumption of fixed capital + Imputed cost of unpaid labour); Imputed cost of unpaid labour for Farmers removed from Produce operating margin, assumed to be 10% of revenues (incl. diversified income and subsidies), inline with unpaid labour as % of England Farm Business Income; *Subsidies and taxes shown as % of revenues pre government interventions; Input includes chemicals, animal feed and seeds and live animals – animal feed and seeds assumed to be 5% of Wholesale of grain, unmanufactured tobacco, seeds and animal feeds (SIC 46.21) based on farmer spend reported in AUK Data; Logistics assumed to be 34% of total revenue for freight transport in the UK, equivalent to % of total freight transport for food; Most recent data used for each source: 2018 for AUK and 2017 for ABS; Revenues and number of businesses in 'Produce' relate to farm holdings (as opposed to farm businesses) and fisheries businesses
Source: Annual Business Survey (ABS), ONS, 2017; Agriculture in the UK (AUK), Defra, 2018; Euromonitor; OC&C and The Grocer Top 150, 2018; Capital IQ database of ~2000 companies; Domestic freight moved by commodity, Department for Transport, 2017

Farmers' profits: Across most farm types, majority of profits come from subsidies

ENGLAND ONLY



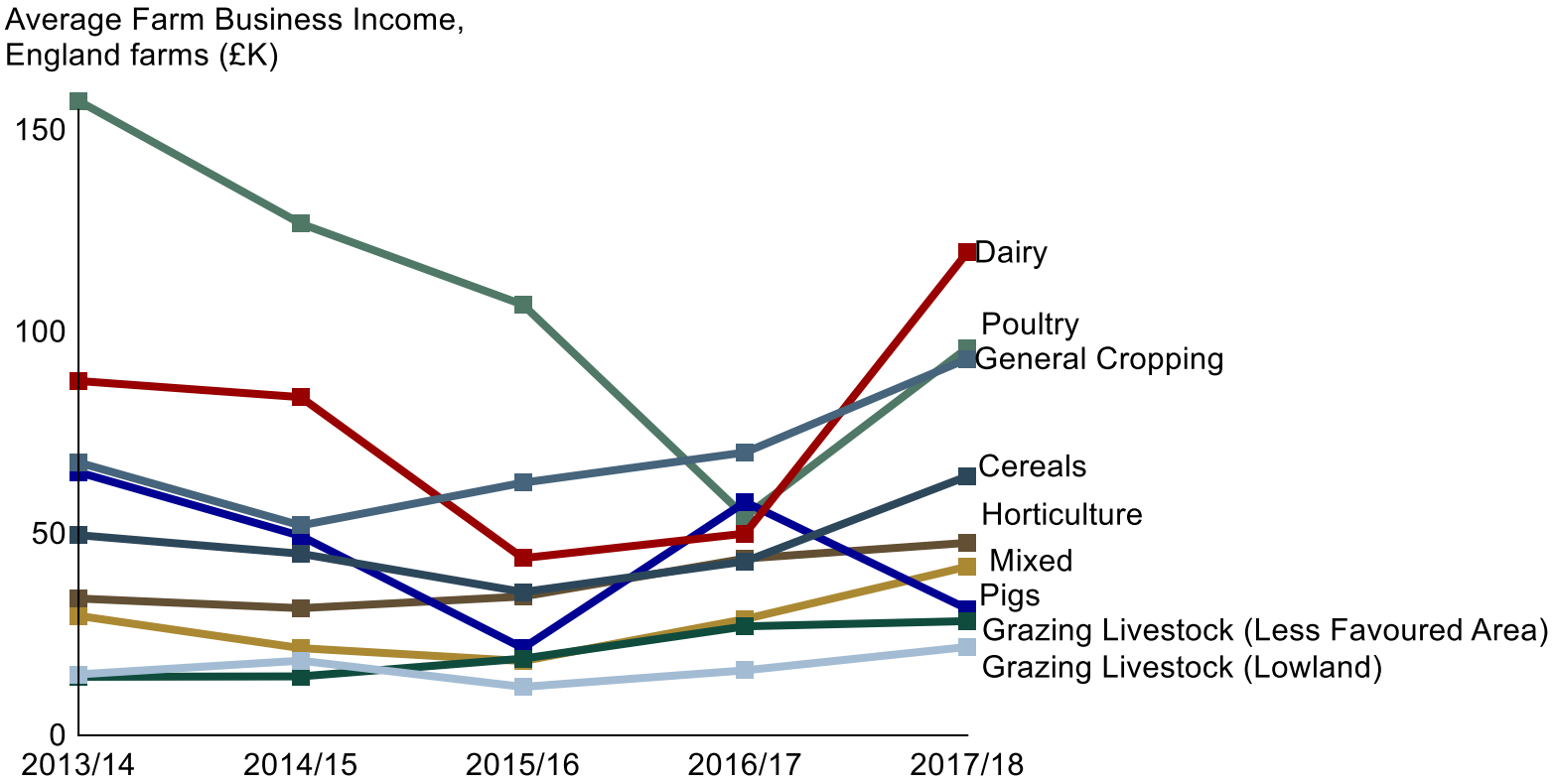
	All farms	Crops			Grazing Livestock			Other Livestock & Mixed		
Avg. revenue per farm p.a. (£K)	289	276	455	366	511	113	106	475	919	262
# Farm Businesses (K)	55	14	5	3	6	6	12	2	1	6

Note: Farm Business Income (FBI) is a standard measure of profit for farms; FBI = total farm output (revenues) – fixed costs – variable costs; FBI margin = FBI / Total Output; FBI is before deducting cost of unpaid labour; Three year averages calculated based on average per farm for 15/16, 16/17 and 17/18; Average for all farm sizes shown; Where overall profit margin and sum of agriculture, diversified income and subsidy income margins do not tie due to averaging (e.g. can average overall margin across 3 years, but data limits average of agriculture margin over 3 years) the difference between overall margin and sum of agriculture, diversified income and subsidy income margins has been allocated proportionately to the three income streams; FBI margins for specific activity calculated as FBI from activity / output from activity; Data based on farms with > €25K standard output (equivalent to revenue) per year, only full time farms shown; Low confidence in data for Poultry and Pig farms due to small sample size; Where FBI from one activity missing by farm type and size, calculated based on overall Farm Business Income, if overall FBI missing, average of larger and smaller farm size taken, if >2 activities missing, figures not shown; Farm types defined on basis of their main agricultural output (> two thirds) - Cereals: cereals, oilseeds, peas or beans; General Cropping: arable crops; Horticulture: fruit, vegetables, bulbs, flowers, mushrooms; Dairy: dairy, Poultry: poultry, Lowland Grazing Livestock: non-dairy cattle and sheep with <50% of land classified as less favoured (low quality); Less Favoured Grazing Livestock: non-dairy cattle and sheep, >50% land classified less favoured; Pigs: pigs; Mixed: no predominant produce; Number of farm businesses based on 17/18 data, farm businesses defined as farms with >€25K output per year
Source: England Farm Business Survey, Defra, 2018

Farmers' profits: Farmers' incomes are exposed to significant fluctuations year on year

ENGLAND FARMS

Farmers' profits are volatile year-on-year



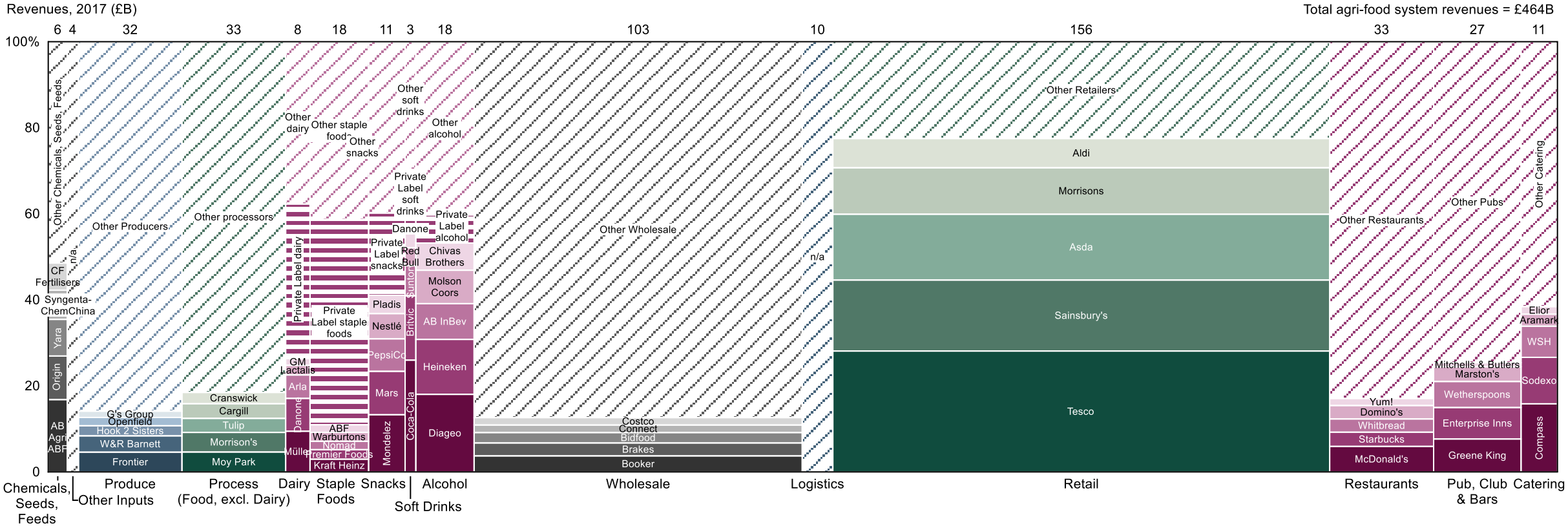
Volatility is driven by a number of factors

"The key drivers of agricultural income include the volume of production, commodity prices and the cost of inputs. These are themselves driven by a range of factors such as the weather, exchange rates, oil price and global supply and stocks of commodities. As a result, ***UK agricultural income tends to be volatile and fluctuate from year to year****"*

Defra, 2019

Note: Farm Business Income represents financial return to all unpaid labour on all capital invested in farm business, calculated by Total Farm Output (Output from agriculture + output from agri-environment schemes + output from diversification + Basic Payment Scheme) – (Variable Costs + Fixed Costs) + Profit / Loss on sale of fixed assets
Source: Farm Accounts in England, 2014 to 2018; Total Income from Farming in the United Kingdom Second estimate for 2018, Defra, 2019

Inequality of bargaining power: Concentration levels vary widely between value chain segments, giving rise to differences in bargaining power



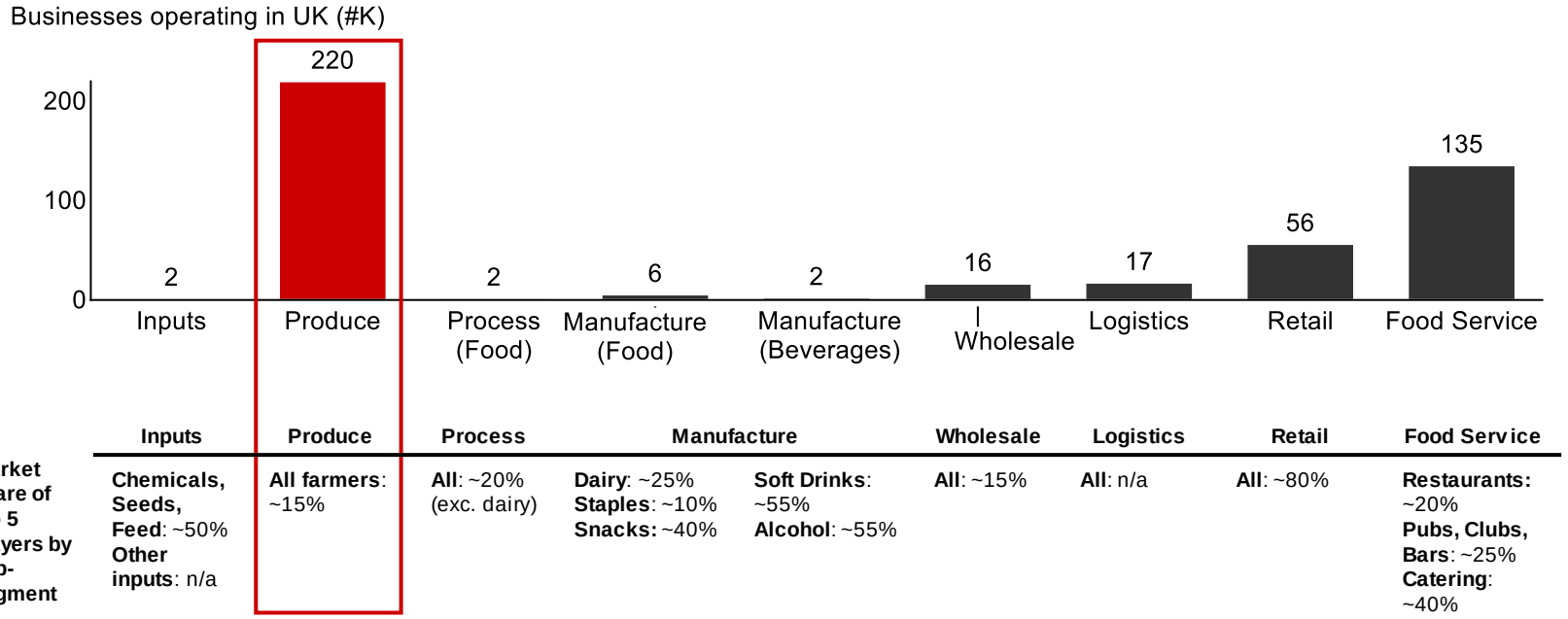
	Input	Produce	Process	Manufacture		Wholesale	Log.	Sell (Retail)	Sell (Food services)
Businesses (#K)	2	220	2	6	2	16	17	56	135

Note: Top 5 players shown in each market; Overall market sizes from Annual Business Survey (excl. Produce), Produce market size based on Agriculture in the UK and Euromonitor; Chemicals, Seeds, Feeds: reported company financials from Capital IQ (CIQ) and Amadeus, companies shown based on global players identified in IPES (2017) report and CIQ data; Other inputs includes wholesale of live animals and agents involved in wholesale of agricultural goods, no players identified; Produce: share shown as latest reported company revenues 2017 – 2018; Process: shares based on CIQ revenues of processing subsidiaries (based on SIC code) of top 15 UK food manufacturers (Grocer report), some overlap with manufacturing as not split out in company financials, Dairy and Beverage processing included in manufacture as ABS and company financial data does not differentiate between activities; Manufacture: share shown as % of total sales in product category, not actual revenues, staple foods includes cooking ingredients, majority of private label is from large branded players but revenues not available; Alcoholic Drinks: reported revenues shown including exports, data provided by Defra; Wholesale: company revenues from Amadeus; Logistics breakdown not available as key players generate revenues in markets other than food; Retail market shares shown as 12 weeks ending 31th Dec 2017 from Kantar; Foodservices: reported company revenues from Global Data; Revenue data from CIQ and Amadeus is for UK-operating companies, but may include some non-UK revenue depending on company reporting structure; Source: Annual Business Survey (ABS), ONS, 2018; Agriculture in the UK, Defra, 2018; Top 150, OC&C / The Grocer, 2018; Kantar World Panel; Global Data; Company Reports; Euromonitor; Company financials from Capital IQ (CIQ), Companies House, Amadeus, Fame; Defra analysis; Too big to feed, International Panel of Experts on Sustainable Food Systems (IPES), 2017

Inequality of bargaining power: UK farming sector is particularly vulnerable given fragmentation and low cooperation between farmers

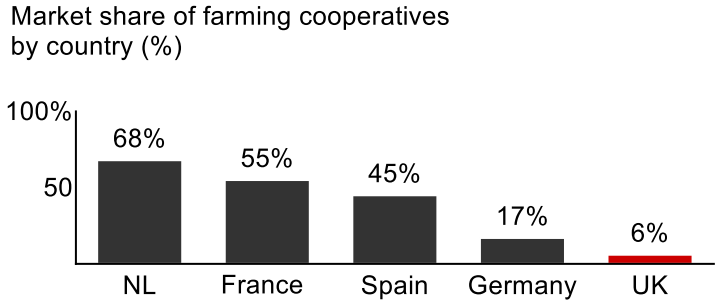
The farming sector is the most fragmented in the food value chain

- UK farming sector is **highly fragmented versus both suppliers and customers**, leading to lower bargaining power:



	Inputs	Produce	Process	Manufacture		Wholesale	Logistics	Retail	Food Service
Market share of top 5 players by sub-segment	**Chemicals, Seeds, Feed**: ~50% **Other inputs**: n/a	**All farmers**: ~15%	**All**: ~20% (exc. dairy)	**Dairy**: ~25% **Staples**: ~10% **Snacks:** ~40%	**Soft Drinks**: ~55% **Alcohol**: ~55%	**All**: ~15%	**All**: n/a	**All**: ~80%	**Restaurants:** ~20% **Pubs, Clubs, Bars**: ~25% **Catering**: ~40%

Cooperation between UK farmers remains low, despite benefits



"Cooperation and collaborative ventures have long been recognised as having many benefits within the agricultural sector, **bringing farm businesses together to achieve greater efficiencies in areas such as purchasing, production and marketing**

…**Government could play an important role** in encouraging and supporting PO/cooperative businesses through **education and training**, **business support in the early stages of development and via capital grants**"

EFFP, 2014

Note: For full breakdown of market shares, see market concentration slide
Source: Annual Business Survey (ABS), ONS, 2018; Top 150, OC&C / The Grocer, 2018; Kantar World Panel; Global Data; Company Reports; Euromonitor; Company financials; Amadeus, Fame; "Conditions Attitudes and Structures of Successful POs and Cooperatives" EFFP 2014; 'UK agricultural co-operatives: Key facts, 'Co-operatives UK [Accessed 15th October 2019]

Inequality of bargaining power: Competition Commission found bargaining power imbalance can lead to excessive risk transfer and unexpected costs

Retailers have used buyer power to transfer excessive costs and risks to suppliers

- The Competition Commission has conducted two major enquiries into the UK grocery market over the last two decades, focused on the relationships between large supermarkets and their suppliers

"…any supermarket that [has] ***shares of more than eight per cent*** *of grocery purchases for resale from their stores are, for the most part,* ***able to control their relationships with suppliers to their own advantage****, whilst the smaller multiples are not able to do so to anywhere near the same extent"*

Competition Commission, 2000

"…[When] grocery retailers ***transfer excessive risks or unexpected costs to their suppliers****, this is likely to* ***lessen suppliers' incentives to invest in new capacity, products and production processes****. If unchecked, we conclude that these practices will ultimately have a detrimental effect on consumers."*

Competition Commission, 2008

The Code was introduced in 2009 to protect suppliers from abuse of buyer power

"The Code sets out how grocery retailers treat their suppliers and aims to ***make sure that they do not abuse their commercial power****."*

Competition and Markets Authority, 2008

- The code, enforced by the Grocery Code Adjudicator (GCA) since 2013, applies to **retailers with annual UK groceries turnover exceeding £1B** – currently 12 supermarkets:

TESCO, ASDA, Sainsbury's, Morrisons, M&S, ALDI, Iceland, LIDL, co-op, Waitrose, ocado, B&M

The Code covers only part of value chain – concerns re unfair practices remain

- The Code **applies only to suppliers who contract directly with designated retailers**, meaning majority of farmers are not covered
- **Calls to extend the GCA remit was rejected** by HMG in 2018, following a Call for Evidence:

"Although there are clearly ***a number of concerns*** *relating to the experience of some farmers and growers in the supply chain, there is* ***no clear evidence of systematic widespread market failures****."*

HMG, 2018

- **The review did, however, introduce new measures to enable primary producers to "survive and thrive"**, including a plan to introduce compulsory written contracts in the dairy sector and a £10M collaboration fund for farmers
- The NFU welcomed the new measures, but found them to be **insufficient**:

"The measures that have been announced to address [the imbalance of power within UK food supply chains] ***do not go far enough****, and it's an opportunity missed"*

NFU President, February 2018

Note: The Code refers to the Groceries Supply Code of Practice
Source: 'Supermarkets – A report on the supply of groceries from multiple stores in the United Kingdom 2000', Competition Commission; 'Notice of designation of TJ Morris Limited under the Groceries (Supply Chain Practices) Market Investigation Order 2009', Competition & Markets Authority, 2019; GfK, Research on suppliers to the grocery market: A Report for the Competition Commission; 'Groceries Code Adjudicator Review: Part 2', 2018

Price pressure: Consumer focus on "low prices / good value" contributes to intense price-based competition

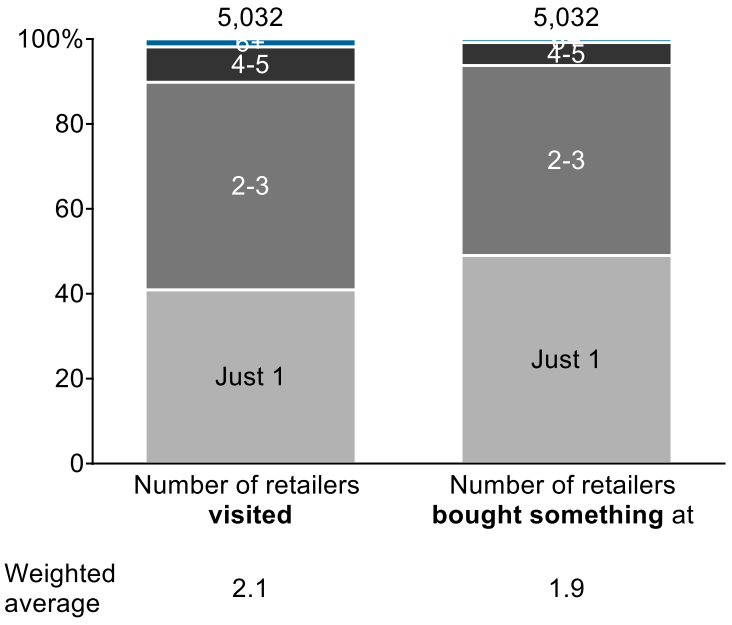
'Good value/low prices' is consumers' top shopping criterion

Shopping criteria for shopping at a specific retailer (mentioned as top 3 criteria)

More than 50% of shoppers use 2+ retailers in a single trip; most common reason is to save money

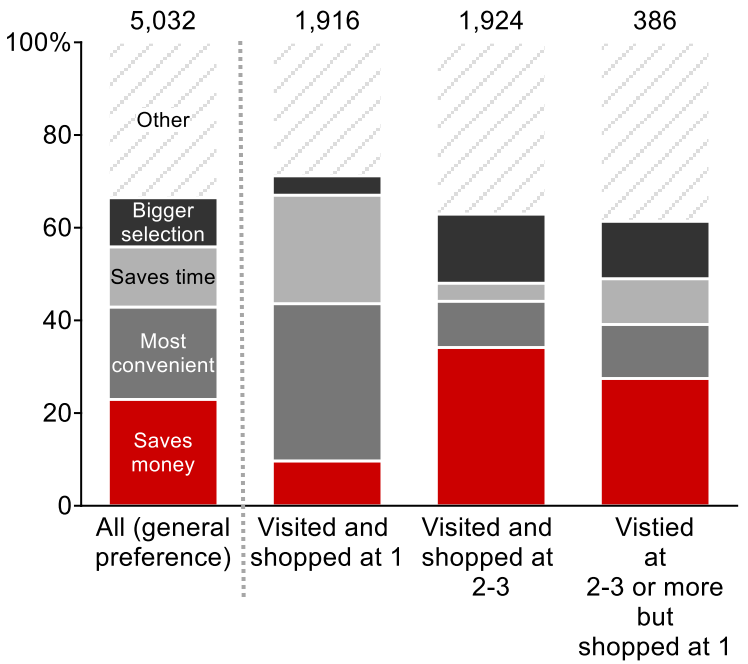
Q: How many different grocers do you typically tend to visit / actually buy something at (in the same trip)?

Average number of retailers shoppers use to browse / shop at: In-store



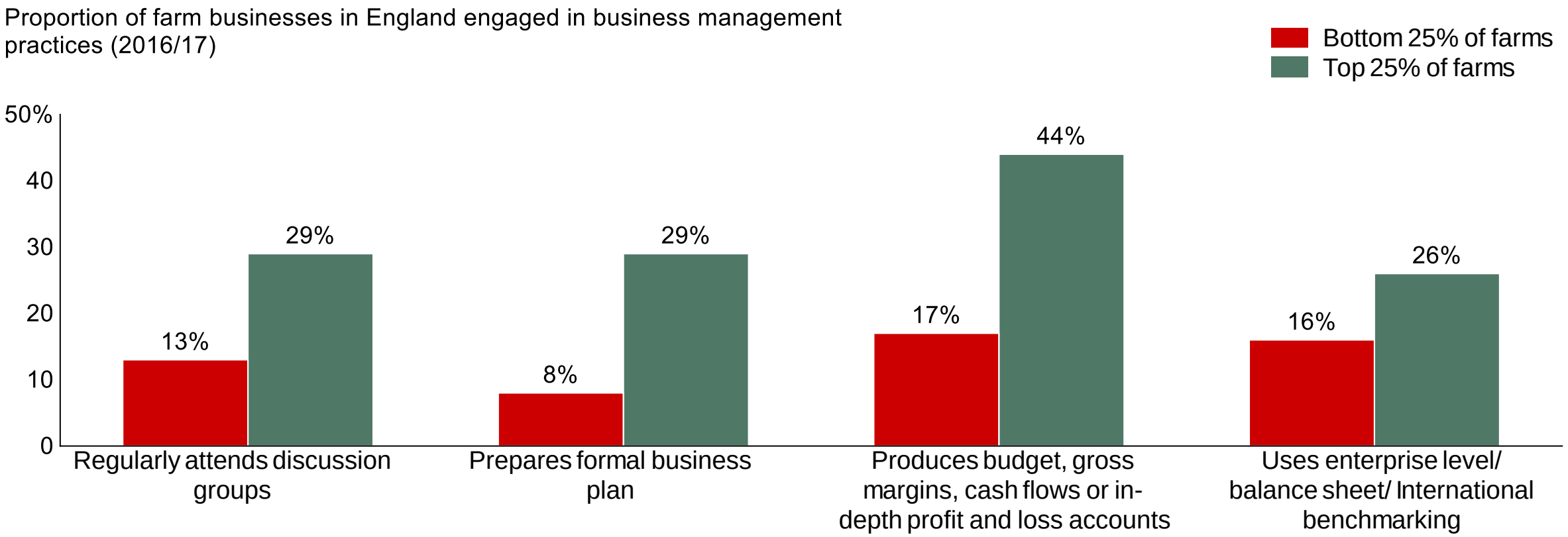
Q: Why do you prefer to shop like this?

Proportion of reasons for stated in-store shopping preference



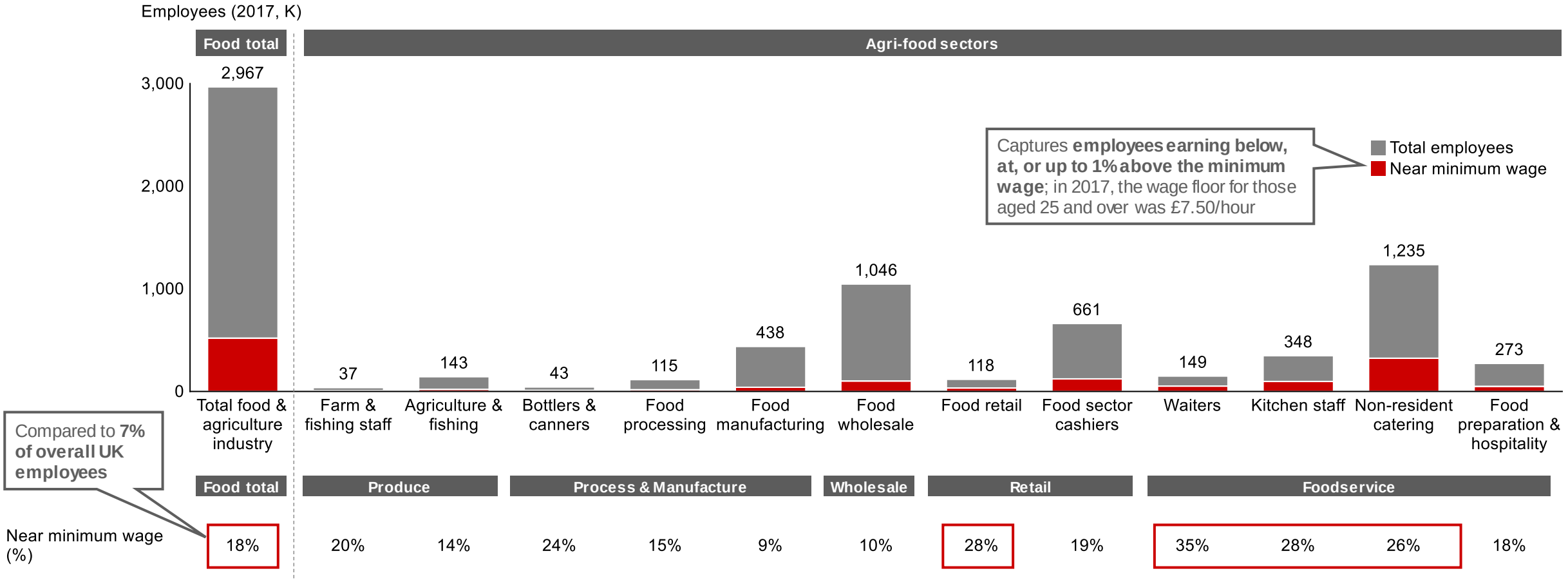
Note: Retailers include all different types of retailers (e.g., Big 4 supermarkets, discounters, convenience stores, farmers markets etc.)
Source: UK grocery consumer survey, Bain, 2018 (N=5,032)

Top performing farms are more likely to engage in business management practices



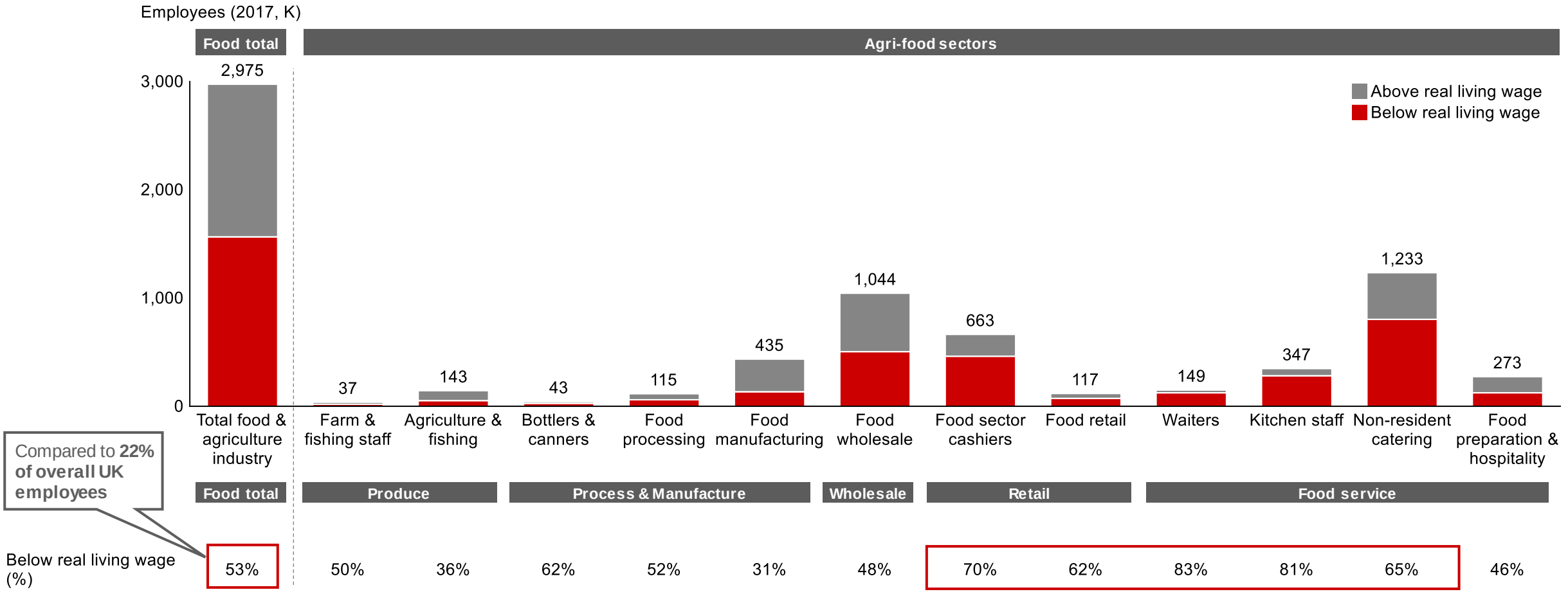
Note: Performance here refers to profitability
Source: The Future Farming and Environment Evidence Compendium, Defra, 2019

Low paid employees: 18% of food industry workers earn near the minimum wage, compared to 7% of all UK employees



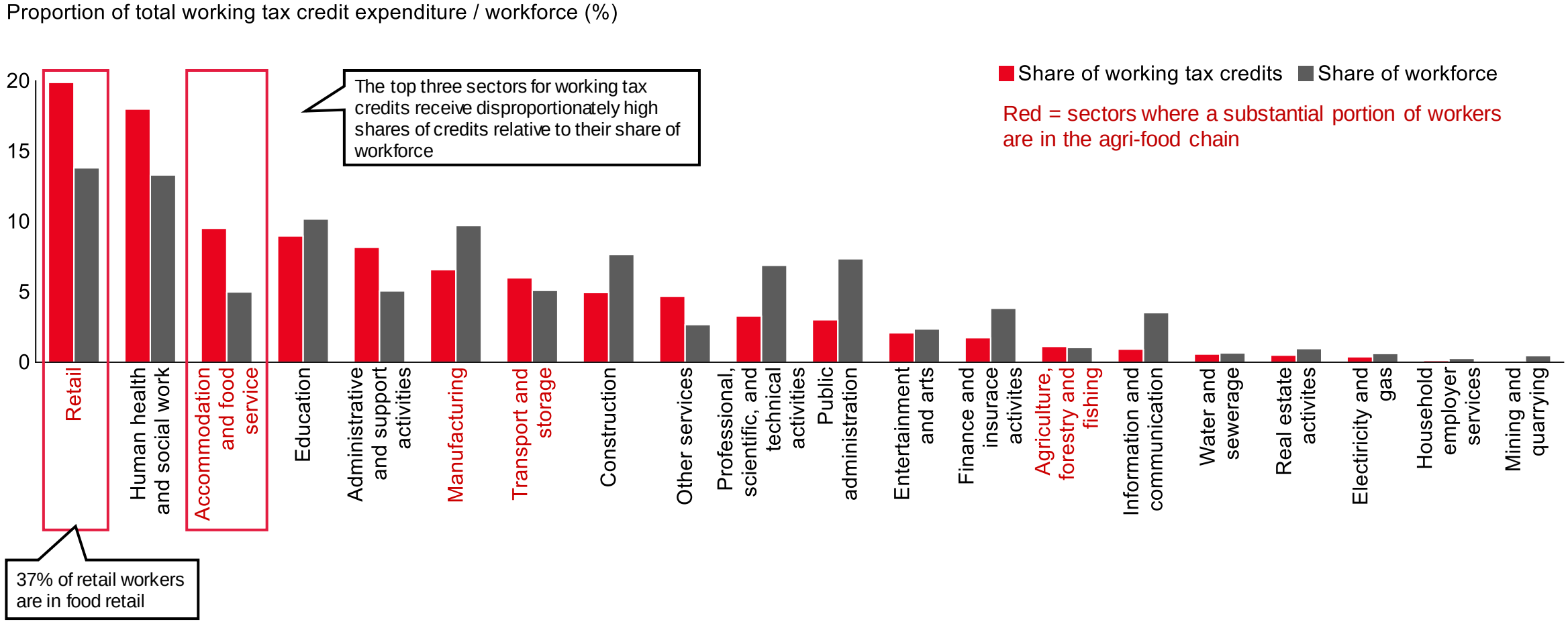
Note: Includes employees paid at, below or near the age-appropriate minimum wage. This captures those employees earning at, below, or up to 1 per cent above their age-appropriate minimum wage. In April 2017, the wage floor for those aged 25 and over was £7.50 an hour, with lower legal minimums for younger workers and first-year apprentices.
Source: Office for National Statistics (2018). Annual Survey of Hours and Earnings, 1997-2017: Secure Access. [19/07/2018]. 11th Edition. UK Data Service. SN: 6699, http://doi.org/10.5255/UKDA-SN-6899-10

Low paid employees: 53% of food industry workers earn below the Real Living Wage, compared to 22% of all UK employees



Note: The real living wage is calculated annually by the Resolution Foundation and promoted by the Living Wage Foundation; Calculations are based on the cost of living, using on a basket of household goods and services; In April 2017, the London Living Wage rate was £9.75/hour and the UK Living Wage rate was £8.45 (in comparison, the national minimum wage was £7.50 for those aged 25 and above)
Source: Office for National Statistics (2018). Annual Survey of Hours and Earnings, 1997-2017: Secure Access. [19/07/2018]. 11th Edition. UK Data Service. SN: 6699, http://doi.org/10.5255/UKDA-SN-6899-10

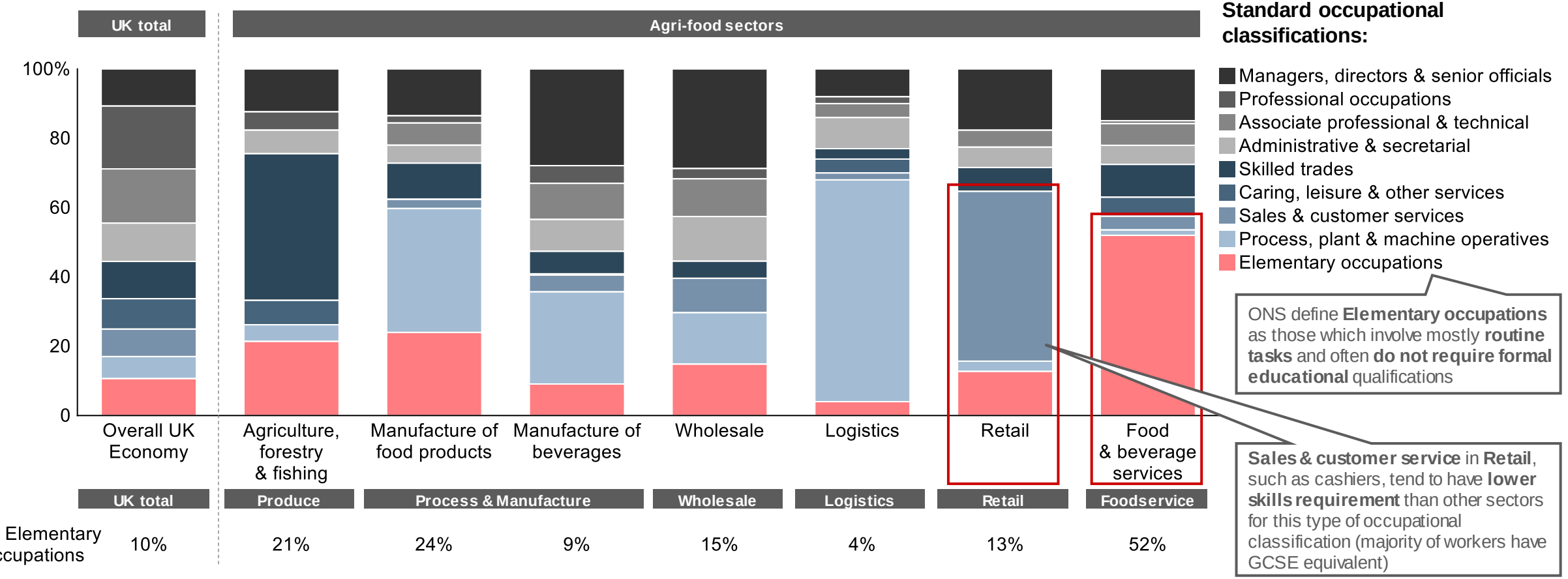
Low paid employees: Attribution of working tax credits to Retail and Food Services is disproportionately high relative to the sectors' share of workers



Note: Attributed amounts per recipient worker vary little by sector; high attributions therefore reflect large workforce sizes and/or a high proportion of the workforce receiving credits
Source: Where does working tax credit go?, New Policy Institute, 2014

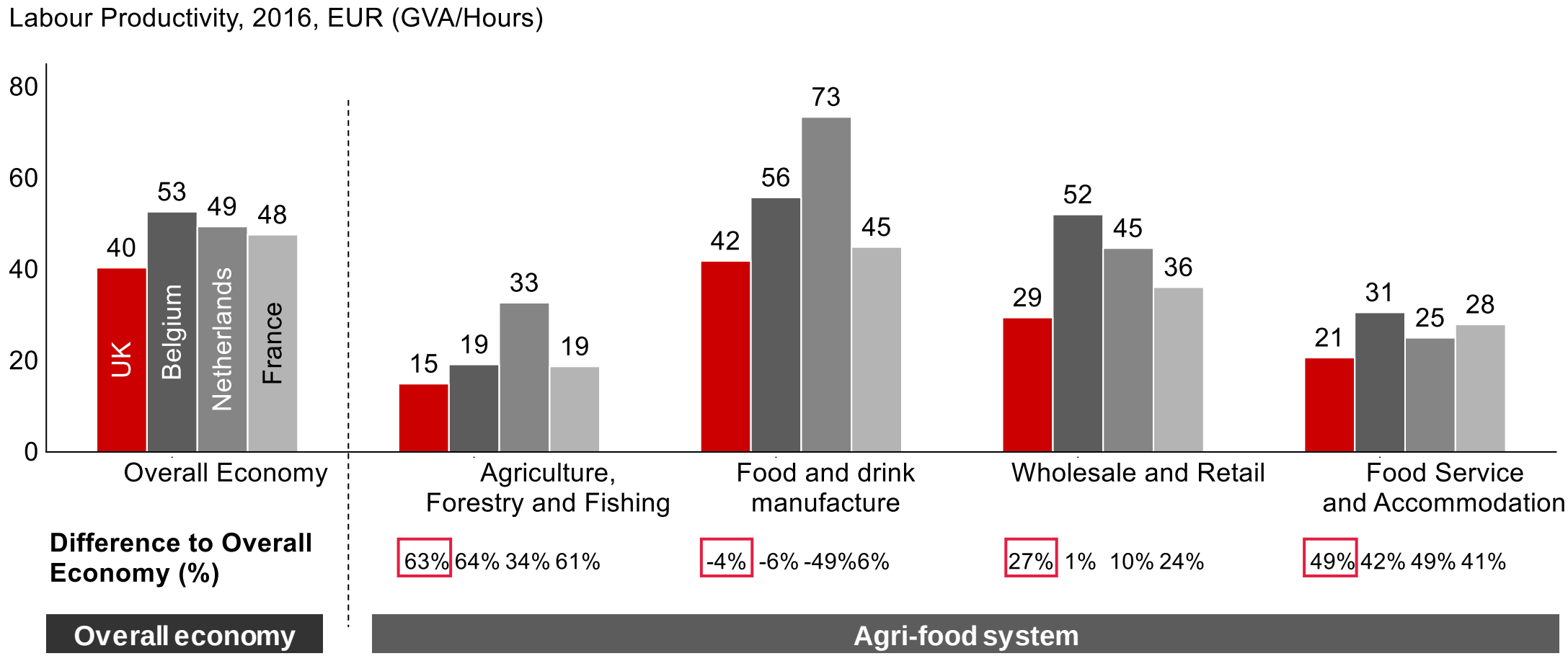
Low-skilled work: The high share of low wages is largely explained by high prevalence of manual and low-skilled labour

Standard Occupation Classification by sector (%)



Note: Food and beverage services have 52% of workforce in elementary occupation, other occupation types assumed to be proportionate to overall hospitality sector; Wholesale, Logistics and Retail not food specific, but assumed to have similar occupation classification breakdowns
Source: Sector Skills Assessment, ONS, 2012 (2010 data, latest available)

Productivity: UK labour productivity lags Belgium, Netherlands and France; this is the case for the overall economy, but even more so in agri-food sectors

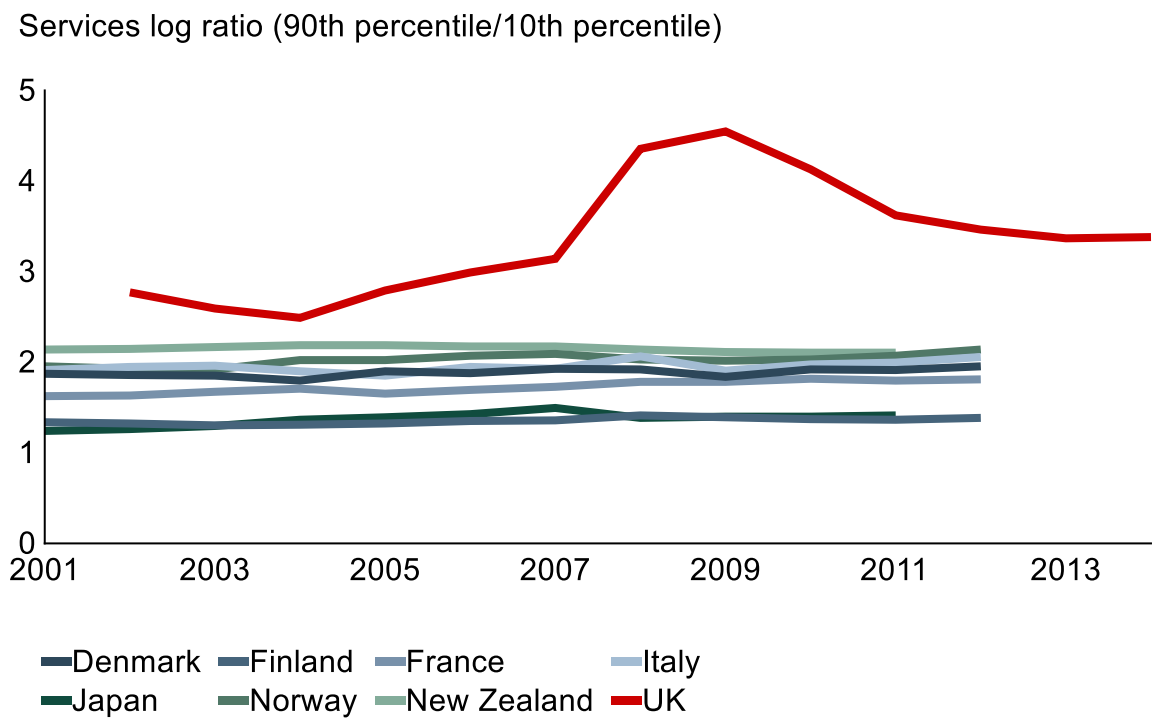


Note: GVA = Gross Value Added; EU average is for 28 EU member states, including UK; Wholesale and Retail and Logistics are not food specific; Food Service includes Accommodation
Source: National accounts employment data by industry, Eurostat [Accessed Nov 2019]; National accounts aggregates by industry, Eurostat [Accessed Nov 2019]

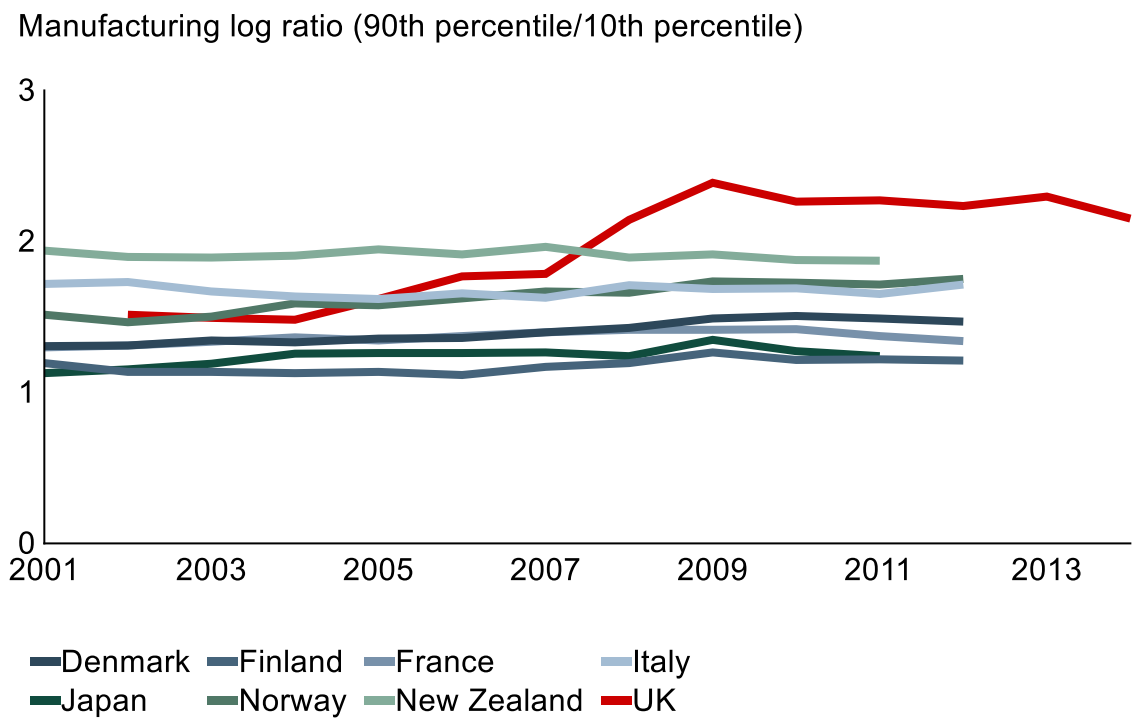
Productivity: Productivity gap between the top-and bottom-performing companies is larger in the UK than comparator countries

Services and manufacturing firm-level productivity dispersion

Services



Manufacturing



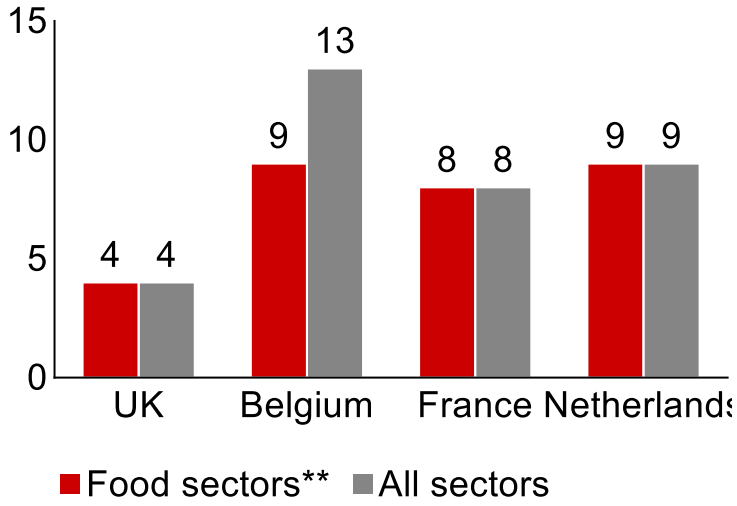
Note: Charts show the log difference between the 90th and 10th percentile firms in terms of productivity, a higher ratio indicates a larger difference between the two percentile brackets and so a larger difference in productivity levels of firms in the country
Source: OECD and Berlingieri, Blanchenay and Criscuolo (2017); ONS Research Database and Bank calculations via The UK's Productivity Problem: Hub no Spokes, The Bank of England, 2018

Productivity: Low adoption of new technologies and inferior human capital management contribute to lag in labour productivity (1 of 2)

Inferior human capital management

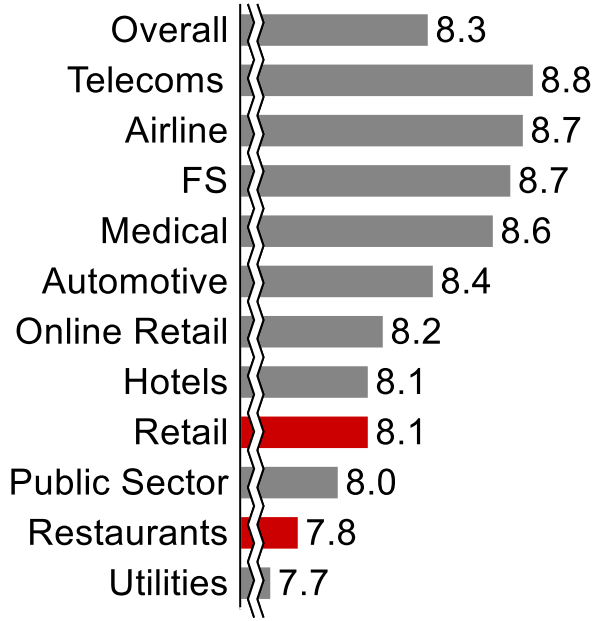
UK employers provide less training than EU peers

Hours of employer-provided training per 1,000 hours worked, 2016



UK Retail and Restaurant employees are less engaged than UK average

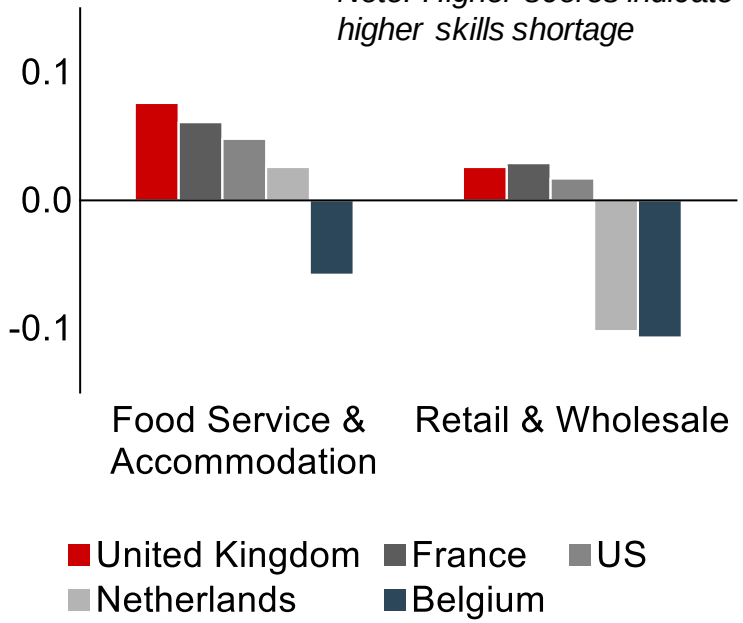
UK Employee Engagement scores, 2018



UK management ability in food sectors lags EU

Resource Management skill shortage scores, 2015

Note: Higher scores indicate higher skills shortage



Note: Retail and Wholesale not food specific, unless stated otherwise; **Food sectors include averages for all Wholesale, Retail, Accommodation and Food Service, not food specific; Positive resource management skill shortage score indicates skill shortage, negative values indicate skill surplus; Resource management skills include personnel, material, time and financial management skills

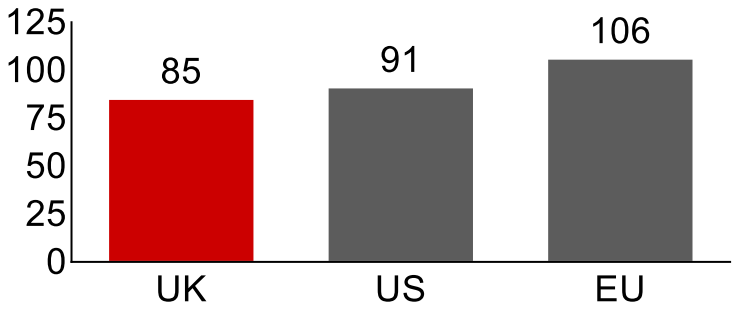
Source: Boosting Britain's low-wage sectors, IPPR, 2016; UK Customer Satisfaction Survey, TTI Global Research, 2018; Skill Needs, OECD, 2019

Productivity: Low adoption of new technologies and inferior human capital management contribute to lag in labour productivity (2 of 2)

Low technology investment and adoption

UK automation lags US and EU average

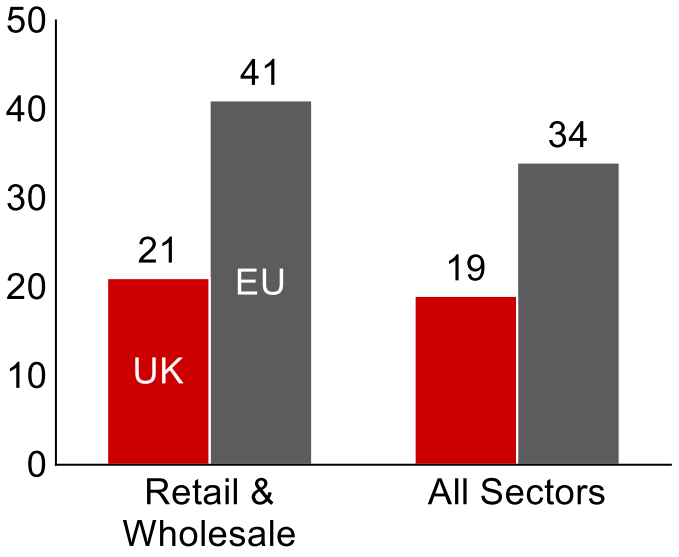
Robot density, 2018
(# installed robot unites per 10k manufacturing employees)



Of the most **likely occupations to be automated** are in the food sector

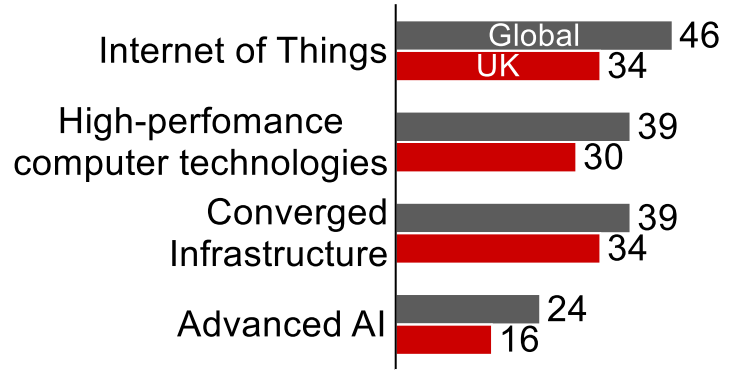
UK adoption of supply chain technologies lags EU average

Enterprise Resource Planning adoption rate, 2017 (%)

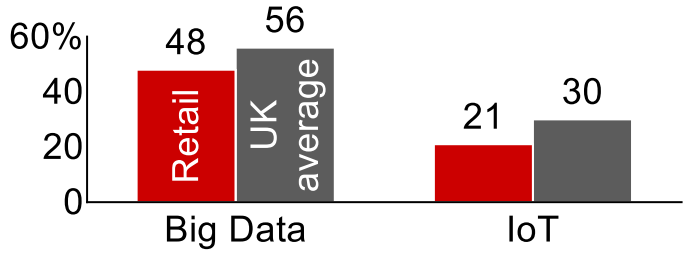


UK businesses are less likely to invest in Next-Gen technologies than global peers

% of businesses* invested in, 2018



UK adoption rate, 2015 (%)



Note: Robot density calculated as the number of installed robot units per 10,000 employees; Retail and Wholesale not food specific, unless stated otherwise
Source: World Robotics International Federation of Robotics, 2018; Probability of Automation in England, ONS [Accessed Nov 2019]; Integration of internal processes, Eurostat, 2017; Realizing 2030: A Divided Vision of the Future, Dell Technologies, 2018 via Solving the United Kingdom's productivity puzzle in the digital age, McKinsey Global Institute, 2018; The Value of Big Data and the Internet of Things to the UK Economy, Cebr, 2016