department for culture, media and sport

Cost-Benefit Analysis of Radio Switchover

Methodology Report

02/07/2012

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Contents

1. Summary

The Government set out in the Digital Radio Action Plan its commitment to produce a cost-benefit analysis of radio switchover. In order to satisfy this obligation and inform any future Government decision on radio switchover, economists at the Department for Culture Media and Sport (DCMS) are constructing a model to evaluate the costs and benefits to the UK of proposals for a radio switchover. This involves comparing radio switchover to a counterfactual of continuing both analogue and digital transmissions.

The model is based upon a number of inputs and assumptions including expected consumer behaviour and future market growth. The basis for these inputs range from data collected through commissioned independent research to evidence provided by industry stakeholders.

This methodology report sets out these inputs and assumptions. It is essential for the reliability of the cost-benefit analysis (CBA), and by association its conclusions, that the inputs and assumptions are robust. Therefore, **we are seeking views from any interested parties about the proposals set out in this report**. Any such comment with, where possible, evidence to support any proposed changes, should be **submitted to the DCMS by Friday 31st August 2012**, either:

- by post to the Radio Team, 4th Floor, Cockspur Street, London SW1Y 5DH; or
- by email to CBARadio@culture.gsi.gov.uk

Consideration shall be given to any evidence submitted as a response to this report and, where appropriate, amendments to the CBA model will be made. After which the DCMS will produce a further report setting out the results and conclusions of the CBA, including estimates of the expected net present value of possible switchover scenarios.

2. Introduction

This report details the methodology which underpins the DCMS's assessment of the costs and benefits of a radio switchover programme. It sets out the approach which the DCMS have taken to modelling these impacts; including changes in the digital radio market under each of the radio switchover scenarios considered and the counterfactual of no switchover. Finally, the report explains the approach to estimating the expected impacts on consumers, producers and the wider society.

Two additional reports are included in Annexes A and B. Annex A sets out the findings of the independent review of the first iteration of the CBA model, undertaken by Europe Economics in 2011. This includes a number of recommendations that have since been incorporated into the CBA methodology; as set out in this report. Annex B is a report produced by London Economics in association with YouGov. This sets out the results of supplementary research conducted in 2012 into consumers' willingness to pay for digital radio, building on previous consumer research by London Economics in association with YouGov in 2011.

Background

The joint Government and industry Digital Radio Action Plan, published in July 2010, sets out the process for providing ministers with the information and assurances necessary to make a decision on whether, and if appropriate how, to proceed with a radio switchover. The Action Plan addresses the key issues around the growth of digital radio. It includes DAB coverage planning, the environmental impact of a radio switchover and mechanisms for converting in-vehicle radios.

In launching the Action Plan, the Government committed to a consumer-led approach to radio switchover; determined by the extent to which listeners choose to consume radio via digital, rather than analogue, platforms. It is for this reason that Government has committed to the following criteria which must be met before a switchover date can be set:

- when 50% of all radio listening is digital; and
- when national DAB coverage is comparable to FM and local DAB reaches 90% of the population and all major roads.

Radio switchover is the point at which all national and large local radio would cease to broadcast on analogue and be available only via digital platforms. However, small local commercial and community services would continue to be available on FM. At this time, no decision has been made on how a switchover would be implemented.

The CBA will be fundamental to the Government's decision on radio switchover and, if appropriate, how it should be implemented. This work is being conducted by economists from the DCMS, in association with other Government Departments.

A similar piece of work to this CBA was carried out by PricewaterhouseCoopers (PwC) in 2009 to inform the work of the Digital Radio Working Group (DRWG)[1]. The PwC cost-benefit analysis pointed to several knowledge gaps. Chief among these was the absence of primary research into consumer behaviour and the willingness to pay for digital radio above analogue. Although the radio ecology and the proposals for a switchover have changed since the PwC analysis was produced, the document provides useful insights and recommendations which have been addressed in the current CBA.

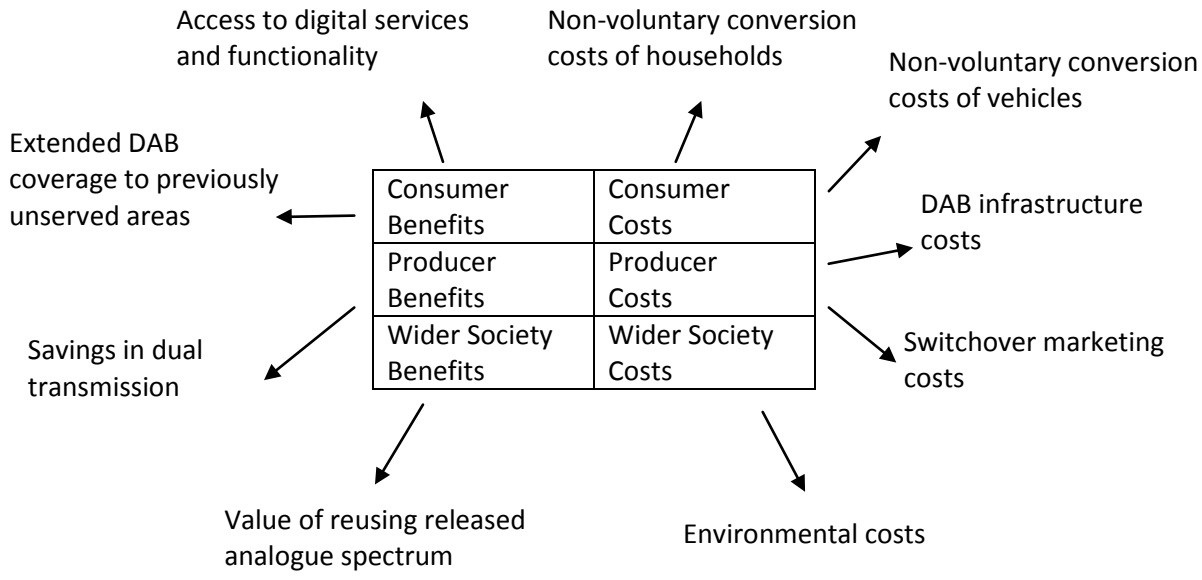
[1] PwC – Cost Benefit Analysis of Digital Radio Migration (2009)

3. CBA Approach

The CBA models the impacts of radio switchover upon consumers, producers and wider society. The incremental benefits and costs of radio switchover described below are calculated against a counterfactual 'business as usual' scenario. The approach to modelling the effects of a switchover can be categorised into the following groups of impacts:

- Consumer benefits from digital radio and extended DAB coverage;
- Costs to consumers of converting their homes and vehicles to digital radio;
- Producer savings in dual transmission costs;
- Costs of switchover marketing and infrastructure for producers;
- Benefits to society from released analogue spectrum; and
- Environmental costs of a digital switchover for disposing of analogue radios and changes in energy use.

Figure 1: Summary of Elements in the CBA



4. Model Scenarios

The CBA assesses the incremental impact of policy interventions to achieve radio switchover compared to a counterfactual of no intervention. The three scenarios under which the DCMS is currently modelling are outlined below. The comparative counterfactual of no intervention assumes that no radio switchover occurs within the relevant timetable but that services continue to be broadcast on both analogue and DAB.

- *Counterfactual Scenario*: this scenario assumes no radio switchover announcement from government. Both analogue and digital radio continue to be broadcast and take-up of digital listening and radios continue to grow in line with current rates. It is used as the baseline against which to assess the incremental impact of the intervention scenarios.
- *Scenario 1 - UK wide Switchover in 2015*: this scenario assumes that radio switchover occurs in 2015. Growth in digital listening and DAB coverage are such that the Government criteria for switchover are met in 2013, with switchover then commencing in 2015.
- *Scenario 2 - UK wide Switchover following market trends*: this scenario gives a later date for UK wide switchover. More cautious assumptions are used for growth in digital listening, following market trends. This scenario currently assumes that the listening and coverage criteria are met by 2016, with switchover then announced for 2018.
- *Scenario 3 - Phased Switchover*: this scenario assumes a nation-by-nation approach to switchover, phased over three years. England switches first in 2017, followed by Wales in 2018 and Scotland and Northern Ireland in 2019.

The costs and benefits will be evaluated over a number of years to estimate the overall and long term impacts. We propose that modelling to around 2030 is likely to be a reasonable period to use to capture the long-term effects associated with a radio switchover. There are likely to be further market and technological changes further into the future meaning that modelling significantly beyond 2030 would not be appropriate because such developments could limit the relevance of assumptions made today. We also note that modelling to 2030 is also broadly consistent with the period of multiplex licences[2].

To conduct the CBA it is necessary to model the UK digital radio market under each of the scenarios described above.

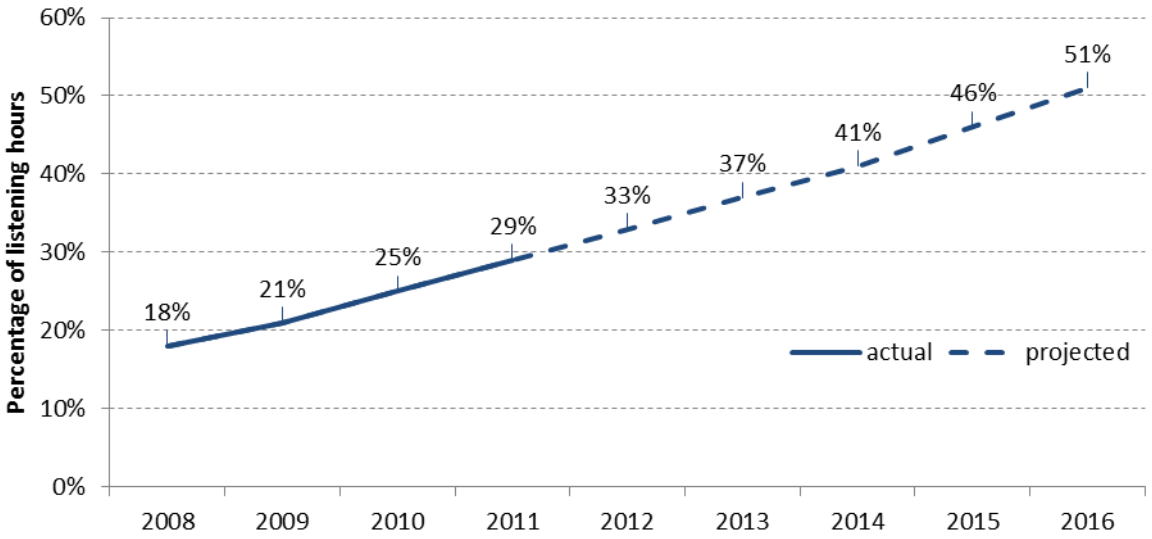
[2] A multiplex consists of a number of digital services bundled together on a single frequency in a given transmission area.

5. Modelling the UK Digital Radio Market

Digital Listening

The Government has stated that 50% of all radio listening should be to digital platforms before a radio switchover date can be set. Therefore, it is necessary to project uptake of digital listening as part of the switchover scenarios. Data on existing digital listening is taken from RAJAR – the official data source for radio listening figures in the UK. This includes listening through DAB, online, and digital television. In the first quarter of 2012 the proportion of UK radio listening through digital platforms was 29.2%[3].

Figure 2: UK Digital Listening - Counterfactual



Source: RAJAR, Frontier Silicon analysis

Forecasts of future listening patterns can vary considerably and **we seek views from industry on the likely growth of digital listening going forward**. However, for the current purposes we have assumed in the CBA model an annual increase in digital listening for the UK of 4 to 5 percentage points a year until 2016 under the counterfactual scenario (see figure 2). This is taken from analysis of digital listening trends undertaken by Frontier Silicon. This projection suggests that digital listening will reach the 50% listening criterion between 2015 and 2016.

[3] RAJAR - Data Release Q1 2012

Listening in the home and listening in vehicles are the two largest listening locations, accounting for 65% and 20% of radio listening respectively[4].

DAB Ownership – in the home

The majority of current digital listening, approximately two thirds, is through DAB radio sets[5]. DAB penetration is therefore of primary importance for the CBA. However, there are other reasons why DAB is an essential factor in the modelling of future listening patterns. This is especially true as listening through a DAB radio can be seen as the most like-for-like replacement for listening on an analogue radio set. Importantly DAB is a platform which is also 'free at the point of consumption'. Whilst other digital platforms are relevant to the 50% digital listening criteria, at this time we have not sought to model up-take, either as a consumer cost or benefit, of digital radio through other platforms. Although we note that consuming radio through Digital TV in a post TV switchover environment, and via the internet, is unlikely to result in significant consumer conversion costs as many consumers will already have access to such devices. However, **we seek views on whether greater emphasis should be given to other platforms in terms of changing patterns of take-up.**

The proportion of households owning a DAB digital radio is related to, but not the same as, the proportion of listening via DAB. DAB ownership has historically been somewhat higher than listening. This is because those households that purchase a DAB radio often continue to use other listening platforms some of the time. RAJAR data shows that DAB ownership in the UK reached 42.6% of households in the first quarter of 2012. Ownership varies across the UK. Ofcom research shows that in the first quarter of 2011 DAB ownership was 37% in the UK, 39% in England, 27% in Wales, 31% in Scotland and 28% in Northern Ireland[6].

While household penetration is not a factor of the government's switchover criteria, it is an essential element of the CBA through its effect on consumer conversion costs. At this time forecasts for household DAB take-up under the counterfactual are taken from Frontier Silicon analysis; with 6.5% of radio listening households without DAB sets assumed to convert per year. These forecasts are based on projecting forward past trends in DAB take-up. Household penetration of DAB under the counterfactual is shown in figure 3.

These estimates are broadly in line with consumers' stated intentions to purchase digital radios in the year ahead (once it is taken into consideration that stated intentions are often high compared to what is realised in practice[7]). The London Economics study, commissioned by the DCMS in 2011, predicted a percentage of those that do not currently own a digital radio but that would be likely to buy one within the next year. The London Economics (2011) estimates, based upon the responses to the online questionnaire, suggest that 1.1% of people are 'certain' and 4.0% 'very likely' to buy a

[4] Ofcom - The Communications Market 2011

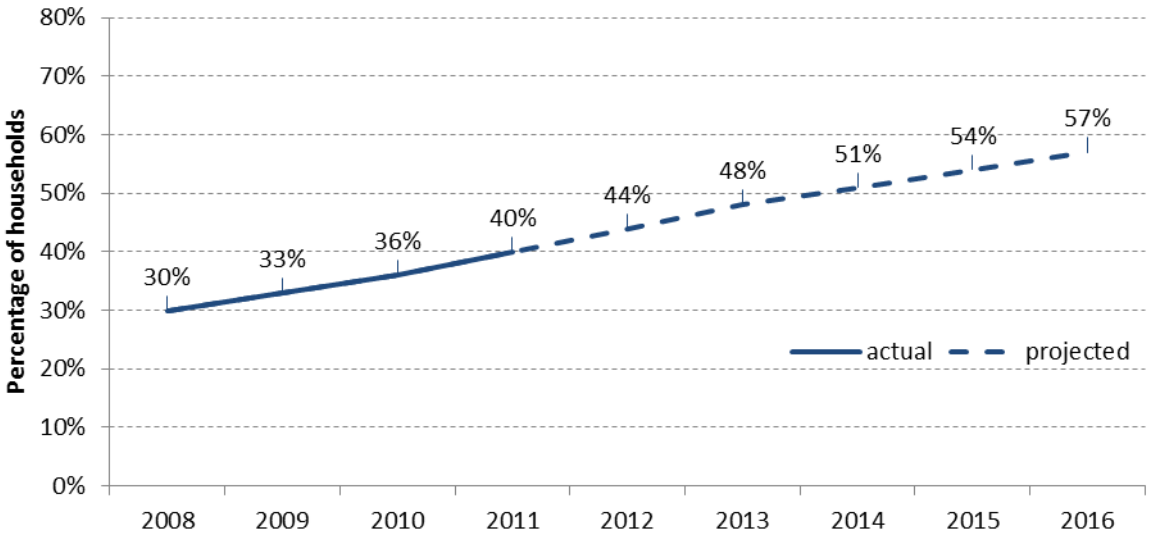
[5] RAJAR - Data Release Q1 2012. The 29.2% of radio listening that was digital in quarter 1 2012 consisted of 19.1% of listening on DAB, 4.4% digital TV, 3.9% internet (and 1.8% unspecified).

[6] Ofcom - The Communications Market 2011

[7] Only results for the highest two categories of stated intentions in the research, 'certain' and 'very likely', are presented here because of the tendency for stated intentions to often be high compared to actual behaviour.

digital radio in the next year[8]. These results are also broadly similar to Ofcom estimates of 4% 'certain' and 6% 'very likely'[9].

Figure 3: UK Household DAB Ownership - Counterfactual



Source: RAJAR, Frontier Silicon analysis

In the switchover scenarios it is assumed that a date for radio switchover is announced two years ahead of the first area to switch. It is to be expected that there would be a fairly rapid increase in DAB take-up following a switchover date announcement.

Table 1: Annual Percentage of Non-DAB Households Converting Under Switchover Scenarios

	Scenario 1	Scenario 2	Scenario 3		
	UK	**UK**	**England**	**Wales**	**Scotland & N.Ireland**
2012	10%	6.5%	6.5%	6.5%	6.5%
2013	20% [A]	6.5%	6.5%	6.5%	6.5%
2014	40%	6.5%	6.5%	6.5%	6.5%
2015	90% [S]	6.5%	20% [A]	10% [A]	10% [A]
2016	6.5%	20% [A]	40%	20%	15%
2017	6.5%	40%	90% [S]	40%	20%
2018	6.5%	90% [S]	6.5%	90% [S]	40%
2019	6.5%	6.5%	6.5%	6.5%	90% [S]
2020	6.5%	6.5%	6.5%	6.5%	6.5%
2021	6.5%	6.5%	6.5%	6.5%	6.5%
2022	6.5%	6.5%	6.5%	6.5%	6.5%

A = year in which switchover date is Announced; S = year in which Switchover occurs *Source: DCMS Model Assumptions*

[8] London Economics – Digital radio switchover: Consumer research to inform the cost benefit analysis (2011)

[9] Ofcom – The Communications Market: Digital Radio Report 2011

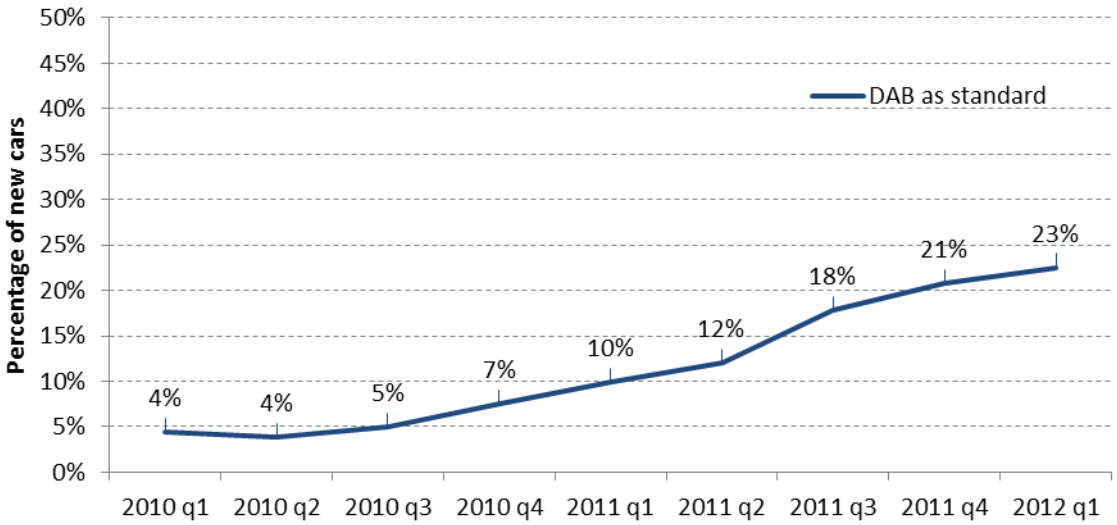
In the year of switchover itself, it is modelled that 90% of remaining non-DAB households that listen to the radio will convert to DAB. After switchover it is assumed that the percentage of remaining non-DAB households which convert to DAB reverts to the trend of 6.5% of these households per year. Clearly it cannot be known with certainty exactly how DAB take-up would respond to a switchover announcement and it may be appropriate to test the assumptions used as part of sensitivity analysis. **We seek views on future patterns of household digital radio take-up under the counterfactual and switchover scenarios**.

DAB Ownership – in-vehicle

To assess the implications of a radio switchover for listening in vehicles it is first necessary to model the vehicle parc[10] over time. This requires information on numbers of vehicles going forward and average vehicle lifetimes, which is sourced from the Department for Transport and the Society of Motor Manufacturers and Traders (SMMT). It is also necessary to make projections both of DAB penetration in new vehicles and conversions in the vehicle parc over time.

DAB take-up for car and commercial vehicle radios has been substantially behind that for household radios, with penetration levels in the first quarter of 2012 at 3% of the total vehicle parc. Digital conversion of radios in the existing vehicle parc has thus far been slow to take-off. However, the proportion of new cars fitted with DAB radios is increasing and is expected to increase further.

Figure 4: UK New Cars Fitted with DAB as Standard



Source: CAP/SMMT

Increasing penetration of DAB in new cars means that the overall proportion of the vehicle parc with DAB will gradually increase over time. In the first quarter of 2010, 4% of new cars were fitted with DAB. This has increased significantly to 10% in the first of quarter 2011 and 23% in the first quarter of 2012. To project DAB penetration in new cars going forward, we assume that the proportion of new

[10] The vehicle parc is the number of registered vehicles in the UK.

cars with DAB increases by 10 percentage points per year under the counterfactual. This is based on the assumption that increasing numbers of car manufacturers are likely to fit DAB as standard over time, as has already started to occur. For conversions of existing vehicle radios we take a cautious assumption that conversions will grow steadily up to 5% of vehicles without DAB converting annually and remain at that level under the counterfactual.

Under the switchover scenarios it is assumed that the proportion of new cars fitted with DAB would rise following a switchover announcement, such that at the point of switchover all new cars would be fitted with DAB. This is broadly consistent with analysis by Digital Radio UK (DRUK) based on industry data and discussions with vehicle manufacturers. DRUK project that if a positive switchover were announced in 2013, then 50% of new vehicles could have DAB at the end of 2013. This could reach 90% at the end of 2015 under the DRUK projections as the market continues to evolve and build out of DAB coverage expands.

For the conversion of existing radios in the vehicle parc, it is assumed that there would be a rapid increase following a switchover announcement in comparison to the counterfactual. This is particularly so in the year of switchover, with 60% of vehicles still using analogue radios assumed to convert at that point. The numbers of annual conversions are more spread out under scenarios 2 and 3 than in scenario 1. This is because there are more conversions and new vehicles fitted with DAB prior to the later switchover announcements under these scenarios. After switchover, it is assumed that a proportion of vehicles still without DAB convert over the following three years, but that a small minority of vehicles do not convert to DAB. As with the assumptions for household radios, it cannot be known with certainty exactly how take-up in vehicles would respond to a switchover announcement and some sensitivity analysis may be appropriate. **We seek views on future patterns of digital radio take-up in vehicles under the counterfactual and switchover scenarios**.

Table 2: Annual Percentage of Non-DAB Vehicles Converting Under Switchover Scenarios

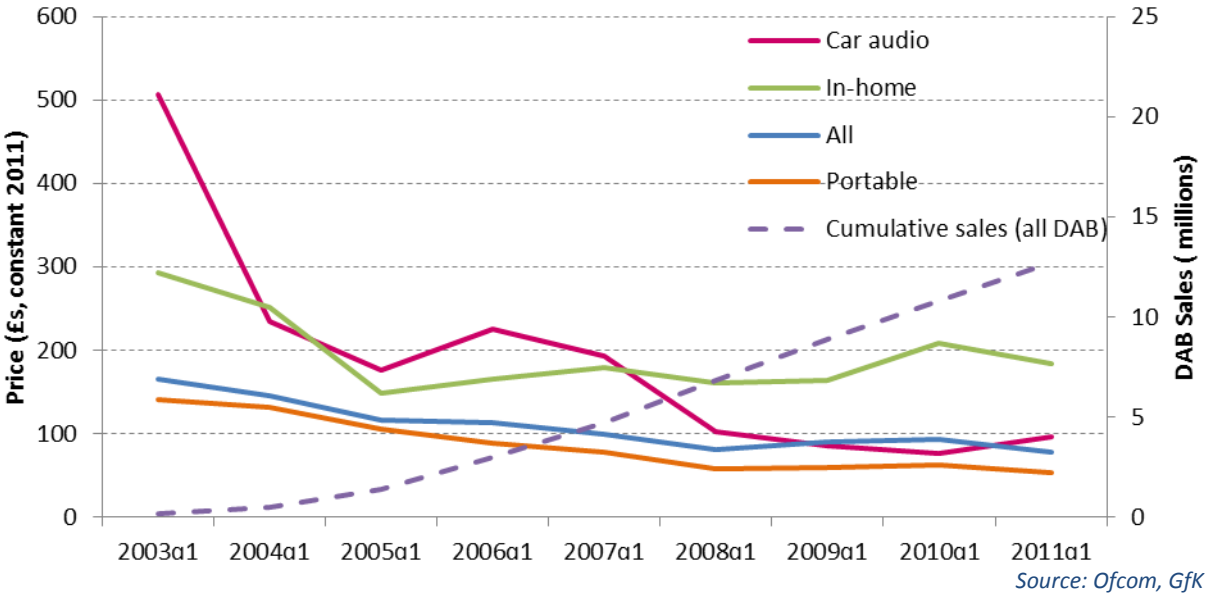
	Scenario 1	Scenario 2	Scenario 3		
	UK	**UK**	**England**	**Wales**	**Scotland & N.Ireland**
2012	2.0%	1.5%	1.5%	1.5%	1.5%
2013	10% [A]	3.0%	3.0%	3.0%	3.0%
2014	30%	4.0%	4.0%	4.0%	4.0%
2015	60% [S]	5.0%	10% [A]	5.0% [A]	5.0% [A]
2016	3.0%	10% [A]	30%	10%	7.5%
2017	2.0%	30%	60% [S]	30%	10%
2018	1.0%	60% [S]	3.0%	60% [S]	30%
2019	0%	3.0%	2.0%	3.0%	60% [S]
2020	0%	2.0%	1.0%	2.0%	3.0%
2021	0%	1.0%	0%	1.0%	2.0%
2022	0%	0%	0%	0%	1.0%

A = year in which switchover date is Announced; S = year in which Switchover occurs *Source: DCMS Model Assumptions*

Prices

Figure 5 shows data giving prices of digital radios (adjusted to constant 2011 prices) split between car audio, portable, in-home and an average overall price[11]. Both the portable and in-home categories are treated as in the home listening for the purpose of the CBA. DAB prices have fallen significantly since 2003, especially for car radios, but have somewhat flattened out in recent years. The overall price closely follows the pattern for portable radios, reflecting that these constitute the majority of the DAB market.

Figure 5: Average DAB Prices by Receiver Type and Cumulative DAB Sales



Source: Ofcom, GfK

In the CBA model, DAB prices fall gradually under the counterfactual scenario as the market continues to mature. Prices are projected forward using experience (or learning) curve modelling as recommended by Europe Economics in their independent review of the CBA. This approach states that for every doubling of cumulative output, costs will fall by a constant percentage (once adjusted for inflation)[12]. This reflects that further innovations and efficiency savings are likely to result as the DAB market grows. As shown in figure 5, the price falls observed have coincided with increases in cumulative DAB sales from 0.16 million in the first quarter of 2003, to nearly 13 million by the first quarter of 2011. Whilst cost and price changes may not always be perfectly aligned due to wider market conditions, this approach nonetheless gives a reasonable approximation of likely price trends going forward. This is a relatively cautious approach based on fitting past data rather than predictions of specific technological innovations which could occur in future.

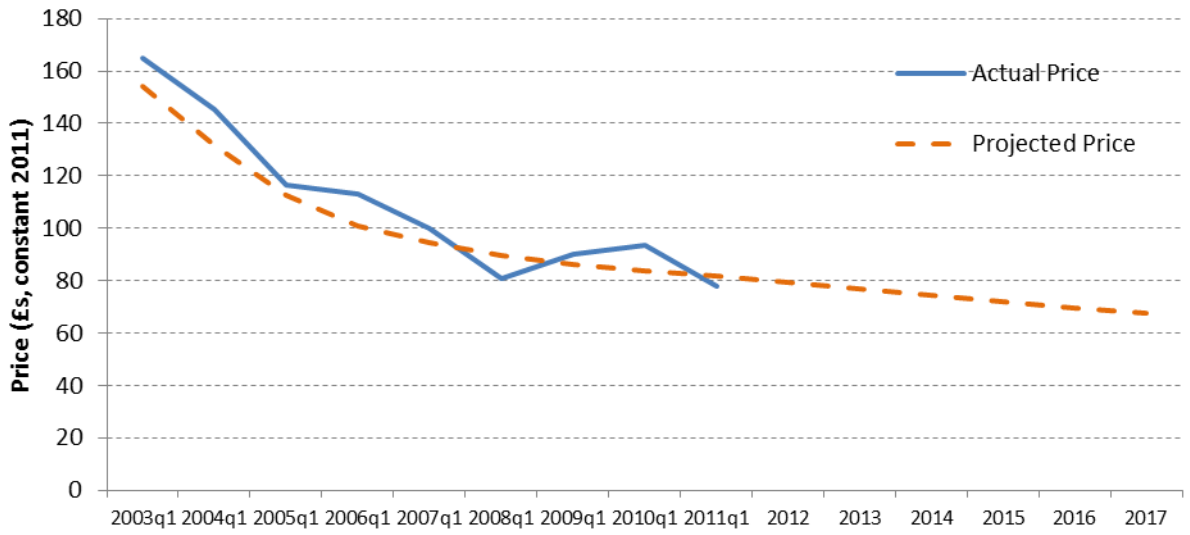
Projections for average DAB prices using this approach are shown in figure 6. This shows a gradual fall in prices on average for all DAB radios under the counterfactual. Many DAB products, particularly portable radios, will however be available for prices well below this average. Indeed, it is worth

[11] Ofcom - The Communication Market: Digital Radio Report 2011; and Ofcom – The Communications Market 2007

[12] Wright (1936) first set out this approach which has been applied in a wide range of areas since.

noting that those consumers that are less interested in the more advanced attributes of digital radio (i.e. those with lower willingness to pay) are more likely to purchase sets at the lower end of DAB price ranges. Prices of these 'entry level' sets may be substantially below the average prices in the projection. Currently lower end prices of DAB radios are around £20 for portable sets and in the region of £80 for car radios[13].

Figure 6: Average DAB Prices Projection - Counterfactual



Source: Ofcom, GfK, DCMS Projection

In line with the experience curve approach, under the switchover scenarios it is expected that prices will fall further as more households convert their sets to DAB and cumulative output and sales rise. As with other key inputs for the CBA, a range of plausible parameters will be used to test the sensitivity of the final results to the price projections. **However, as this is an essential element of the CBA we are seeking views on the likely pattern of household and vehicle DAB prices, both on average and for 'entry level' receivers.**

Analogue radio prices are also relevant to the CBA. This is because under the counterfactual some groups of consumers that are less interested in digital radios are likely to buy analogue radios, rather than digital. If digital radios remain more expensive on average then these consumers may incur higher costs if they were to instead buy digital radios following a radio switchover. The average price for a portable analogue radio was £17 in the last year[14]. As analogue radios are a mature technology there is arguably less scope for prices to fall as a result of efficiency improvements over the period of the CBA. Therefore, analogue radio prices are assumed to stay constant (adjusted for inflation) under the counterfactual.

[13] From survey of online products available in April 2012

[14] For the period February 2011 to January 2012. GfK data, Frontier-Silicon analysis

6. Modelling the Costs and Benefits for Consumers

Radio switchover impacts consumers in two ways. First, there are the additional qualities and attributes of digital radio to listeners above those available on analogue; in the CBA these benefits are measured by consumers' willingness to pay (WTP). Second, there are the costs to replace analogue radio sets with digital alternatives, 'conversion costs'; these are modelled separately for household and vehicle radios in the CBA. The relative size of these two effects dictates the net impact upon consumers. For those consumers with a WTP for digital radio above their cost, this difference gives their consumer surplus[15].

Under the counterfactual scenario, it is expected that digital listening and DAB ownership will continue to increase, as set out in section 5. Consumers purchasing DAB radios under the counterfactual will be benefiting from DAB radio (i.e. their WTP exceeds their costs) otherwise they would not purchase a DAB radio. However, the purpose of the CBA is to measure the incremental impact of a switchover announcement. Hence these benefits are not included on the assumption that they occur irrespective of an announced switchover date. The costs and benefits under the switchover scenarios are discussed below.

Household Conversion Costs

Consumers would incur costs as a result of radio switchover through the need to replace analogue radios with digital alternatives. It is assumed that analogue radios are primarily replaced with DAB radios as this is the most equivalent alternative and the majority of digital listening is through DAB. This is arguably a cautious assumption that could overstate conversion costs; because some consumers may instead adopt alternative platforms for digital listening already available to them so will not require new purchases.

The basis of the CBA is to quantify the conversion cost, resulting from a switchover decision, necessary to continue to receive the radio services currently available on analogue following switchover. The chief focus in this respect is to quantify the conversion of the primary radio set in a household. These are the sets used by households for most of their listening. For the purposes of the CBA, households with at least one DAB receiver are considered to be converted as they can access the relevant radio services on DAB.

Of course we recognise that many households have more than one radio set in their home. It is estimated that the average number of receivers per household that are used 'most weeks' is 1.9[16].

[15] Consumer surplus is a measure of the welfare to a consumer from consumption of a good or service. By definition, consumer surplus is the difference between the price a consumer actually pays for a product or service and the maximum amount that they would be willing and able to pay for that product or service.

[16] Ofcom – The Communications Market: Digital Radio Report 2011

However, it is uncertain whether households with multiple sets would chose to convert all of their radios under the switchover scenarios as additional sets are used less frequently than the primary set. Households may not replace all of their analogue sets with DAB because of the availability of alternative digital listening platforms, such as the internet or digital television. In addition, analogue sets would still receive certain stations as community radio will continue to broadcast on analogue. For these reasons, it is assumed that households which convert as a result of switchover only replace their primary set with a DAB radio. The possibility of including secondary sets and further analysis of alternative digital listening platforms will be investigated further for future iterations of the CBA, possibly as part of the sensitivity analysis.

The conversion costs for household radio sets are incurred by those households that would not have bought a DAB radio under the counterfactual, but will do so as a result of radio switchover. These consumers therefore incur the cost of buying a digital radio as a result of switchover. The take-up and prices of DAB radios under switchover scenarios are compared to the baseline to estimate this cost. As discussed by Europe Economics in their review of the CBA, the relevant economic cost to consumers is not the full price of a DAB radio. This is because old analogue radio sets will at some point need to be replaced with new sets irrespective of a switchover.

The cost of purchasing a DAB set is thus partially offset by the cost that would have been incurred when analogue sets reached the end of their lifetime. Therefore, the cost of converting to DAB is the incremental cost of a DAB set above that of an analogue set, plus any loss from bringing forward replacement of sets as a result of a switchover announcement[17]. Consumers who replace their sets with DAB radios at the lower end of the DAB price range may have a relatively low incremental cost. This is because the difference in price between lower end DAB sets and analogue sets is likely to narrow as DAB prices fall over time. These consumers will, however, still incur any loss from bringing forward the replacement of sets.

Vehicle Conversion Costs

Around 20% of all radio listening takes place in vehicles[18]. Therefore, it is necessary to consider the cost of conversion required for listeners to continue to receive services in their vehicles after switchover. As with household radios, consumers that do not purchase a digital radio for their vehicles under the counterfactual are assumed to incur costs under the switchover scenarios. In new vehicles there may be an implicit price increase for those fitted with a digital radio above those with analogue. For vehicles already on the road, there is a cost from purchasing and fitting either replacement radio sets or conversion kits. As the proportion of new cars fitted with DAB radio as standard is expected to increase quite significantly under the counterfactual, it is the conversion costs for the existing vehicle parc that constitute the majority of costs going forward in the switchover scenarios.

[17] The cost of bringing forward replacement of radio sets is in part because of the time value of money; meaning that costs incurred sooner are higher than those incurred later in present value terms. See the Europe Economics Independent Review of the CBA Model (2011) in Annex A for further discussion of costs associated with bringing forward purchases.

[18] Ofcom - The Communications Market 2011

The average price of DAB car audio was £96 in the first quarter of 2011 (see figure 5). However, this is an area where technological innovation could potentially reduce costs fairly rapidly; for example as DAB converter equipment is further developed. Prices may also fall as the market increases in size and maturity due to economies of scale and competition effects. **We would welcome further evidence on the likely development of the vehicle audio market to inform the analysis of vehicle conversion costs.**

Estimating Willingness To Pay

There are attributes of digital radio listening that enhance the consumer experience above those of analogue listening. The value that consumers place on these attributes can be interpreted as their willingness to pay (WTP) for digital radio. DCMS commissioned research from London Economics in association with YouGov to estimate the value to consumers of various characteristics of digital radio listening[19]. As part of the research focus groups were held (with both DAB and non-DAB listeners) to identify the differentiators between analogue and digital radio. These focus groups identified six attributes and qualities of digital radio, these were:

- how the radio is tuned;
- information which is displayed on the radio;
- functionality, specifically the ability to pause/rewind broadcasts;
- total number of stations available;
- number of speciality stations available; and
- sound quality.

London Economics conducted a choice experiment to estimate how consumers value the digital radio attributes in question and hence estimate consumers' WTP. This was undertaken through an online survey of a nationally representative sample of consumers. Respondents were presented with choices between bundles of radio attributes with different prices. The WTP for the attributes of digital radio can then be estimated from the choices respondents made. The WTP for individual digital radio attributes are aggregated to give a total WTP for digital radio of £41.82 (in 2011 prices).

It is also worth noting estimates of WTP from the previous PwC cost-benefit analysis. Drawing on evidence from the relevant literature, PwC used estimates of WTP for digital radio per household per year of £36.75 in their high case and £24.90 in their low case in 2009 prices (or £38.68 and £26.21 respectively in 2011 prices)[20]. However, PwC pointed to the need for primary research, which the London Economics work provides.

Alternative values for the WTP are used in the CBA to test the sensitivity of the model around this key parameter. The London Economics estimate is currently taken as an upper estimate. This is to

[19] London Economics - Digital radio switchover: Consumer research to inform the cost benefit analysis (2011)

[20] PwC – Cost Benefit Analysis of Digital Radio Migration (2009). Note that the London Economics and PwC WTP estimates given are not like-for-like for comparison, because the London Economics WTP estimate is not applied as per household per year (as discussed overleaf).

take a conservative approach and because both the aggregation of individual attributes to give the total WTP and the use of an online survey could potentially mean the estimate is on the high side. Aggregating the individual attributes could potentially give a WTP that is high because this requires a number of assumptions to be made regarding interactions between attributes and consumers' budget constraints[21]. The use of an online survey may give a slightly high WTP for digital radio because internet users might be expected to value new technology more than the population in general. However, it is possible that future technological innovations could lead to an increased WTP for digital radio as the market develops going forward, above that estimated in the London Economics report. In particular, there may be new attributes and functions that develop for digital radio in addition to the six listed above.

Application of Willingness To Pay

The estimated WTP for digital radio is applied within the CBA to model the benefits to consumers who convert to digital radio as a result of a switchover announcement. The WTP is applied in line with the forecasts and assumptions for take-up of digital radio outlined in section 5. In each switchover scenario the benefits under the baseline are compared to those with a switchover announcement to estimate the incremental effect.

In their independent review, Europe Economics identified four areas where the way in which the WTP is applied warranted further investigation. They argued that it was not sufficiently clear how respondents interpreted the choice questions of the London Economics (2011) research with respect to whether:

- the cost they would incur was one-off or annual;
- the attributes of digital radio would be available in-home, in-car or both;
- the attributes of digital radio would be available on just one radio set, or on all radio sets owned by the household;
- they should be responding as an individual or on behalf of their household.

These points are important for how the WTP estimates are applied within the CBA and hence for the estimation of the consumer benefits from digital switchover. For example, if the cost is interpreted as one-off (like purchasing a radio set), this would imply that the estimated WTP for digital radio represents respondents' expectations of the total benefits they receive over the lifetime of their radio. If, instead, the cost is interpreted as an annual payment (like paying a licence fee or subscription), then the estimated WTP represents the benefits that respondents receive from digital radio repeated in every year that they listen through a digital radio.

DCMS commissioned supplementary research with London Economics in association with YouGov to provide greater clarity on the WTP results. This research reproduced the original choice experiment with a smaller sample and then asked further questions around how respondents interpreted the

[21] See London Economics (2011) report, and the Europe Economics Independent Review of the CBA Model (2011) in Annex A, for further discussion.

questions with respect to the four points above. This allows quantitative estimates to inform application of the WTP results. In addition, twenty in-depth interviews were conducted with respondents to give deeper qualitative understanding.

This research concluded that a clear majority of respondents interpreted the cost as one-off, like purchasing a radio set, and considered their preferences as an individual rather than those of the household as a whole. This is consistent with applying the WTP for each individual and as the total over the lifetime of a radio set in the CBA. For example, a household of two people with a DAB set would on average have a total WTP over the lifetime of the set of up to £83.64 (two times the estimated WTP of up to £41.82). This is a conservative way of modelling the consumer benefits in comparison to applying the WTP as a repeated annual amount. Respondents mainly considered their responses in the context of listening in the home, but in a number of cases in-vehicle radio was also considered at least to some extent. Respondents were fairly evenly split between whether they considered one radio set, or all of their sets. The findings from the online survey and the in-depth interviews were generally consistent in these conclusions. The results of the London Economics research allow the WTP to be applied as a weighted average of the alternative interpretations, perhaps as part of sensitivity analysis to test the implications for the CBA results[22].

Net Consumer Effects

The London Economics WTP estimate is an average across consumers. However, the WTP will in reality vary across consumers, and so a radio switchover would affect different groups of consumers in different ways. For the purposes of the CBA it is assumed that those who have already converted to DAB and do not purchase further sets are not materially affected by switchover.[23] It can be conceptualised that there are broadly three types of consumer that purchase digital radios going forward for whom the impact of switchover is different[24].

There are those consumers who do not have access to DAB coverage under the counterfactual, but are brought within coverage as a result of a switchover announcement. If the average WTP for digital radio is above the costs for this group of consumers, then this group will benefit on average as a result of a switchover announcement. This is because these consumers would otherwise be unable to realise this benefit because of a lack of coverage under the counterfactual. This group is particularly likely to benefit if a switchover announcement leads to a fall in DAB prices as the market expands. It is anticipated that approximately 10 per cent of the population would be additionally brought within coverage of DAB as a result of a switchover announcement.

Those consumers that choose to convert to DAB going forward under the counterfactual have a relatively high WTP. Their WTP is equal to or higher than the cost of a digital radio, otherwise they

[22] See London Economics (2012) report in Annex B for further details of the results of this research.

[23] This is the case because they have already incurred the costs of converting to DAB. It is assumed that the benefits they receive from existing sets are not affected by switchover. This is a simplifying assumption. It is possible that improvements in digital services may occur following a switchover, or that technological improvements could result that mean these consumers chose to replace DAB sets with newer models.

[24] See the Europe Economics Independent Review of the CBA Model (2011) in annex A for a similar discussion.

would not purchase under the counterfactual. Therefore, there is consumer surplus from owning a DAB under the counterfactual for this group of consumers. If there is no difference in price levels following a switchover announcement, then this group of consumers is not affected by switchover. These consumers are, however, affected by radio switchover if their cost of buying a DAB set changes as a result of a switchover announcement. This cost may fall if the increase in the size of the DAB market (for example resulting from purchases by other additional groups of consumers) leads to efficiency savings in production. In which case, these consumers will benefit as a result of switchover, with increased consumer surplus.

Those consumers that choose not to buy a digital radio under the counterfactual, but do so as a result of switchover, have a lower WTP. These consumers do not purchase under the counterfactual because the costs under the counterfactual are higher than their WTP. If the cost of digital radios is unaffected by a switchover announcement, then these consumers are worse-off as a result of switchover because their conversion costs exceed their WTP. However, if DAB prices fall as a result of a switchover announcement, some of these consumers will benefit because their WTP will be higher than the new cost of DAB radios under the switchover scenarios. This is because many of these consumers will still have a positive WTP for digital radio, and some may have a WTP just below the conversion cost under the counterfactual. Therefore the conversion cost will be partially offset by the benefits from digital radio.

One method to control for this offsetting effect is through making assumptions about the demand curve for the third category of consumers. The WTP for these consumers must be between the cost of conversion under the counterfactual and zero (for the reasons explained above). On the assumption that the demand curve is linear (i.e. a straight line) the WTP for this group of consumers will on average be half way between the cost of conversion under the counterfactual and zero. This implies that the difference between the conversion costs and the WTP will be equal to half the conversion cost for this group of consumers on average. Hence halving the conversion costs gives the net effect on these consumers. This type of method was adopted in the PwC cost-benefit analysis and in the digital television switchover analysis. However, it may be possible to make a more precise estimate through splitting participants in the London Economics (2011) research by digital ownership. The WTP for digital radio for those who do not currently own a digital radio can therefore be separately estimated. This would allow the extent to which conversion costs are offset by the WTP to be modelled more explicitly in the analysis. This is an area for further work ahead of the next iteration of the CBA to assess which method gives the more accurate results.

Vulnerable Consumers

The CBA necessarily considers impacts of the scenarios modelled on consumers in general. However, there may be groups of vulnerable consumers for whom the impacts of a switchover could be different. The 2011 London Economics research included face-to-face interviews with potentially vulnerable consumer groups. In particular, low-income pensioners and blind or partially-sighted radio listeners were interviewed. This was to ensure the views of these groups were included in the field work. However, London Economics recommended that further research into the impact of a switchover on vulnerable groups should be considered. **We seek views on the differential impacts of a switchover for vulnerable consumers.**

7. Modelling the Costs and Benefits for Producers

Transmission Cost Savings

The CBA counterfactual is based upon the continuation of both analogue and digital radio services at the current level, including any commitments undertaken as part of multiplex licence renewals. There are some further investments in the digital transmitter network. For example, the counterfactual also assumes the BBC fulfils commitments to increasing their digital coverage to 97%. Importantly, the counterfactual recognises that the analogue networks will require significant new investment if they are to remain in operation until 2030. Analogue costs are therefore expected to rise rather than fall in the counterfactual. While the radio switchover criteria require that local DAB coverage covers at least 90% of the population, we have not assumed the necessary cost of achieving this in the counterfactual at this time. This is because we are not aware of any immediate plans for such infrastructure to be built. However, this is something which we will keep under review.

The costs and benefits to producers in respect of transmission costs are the costs of building out DAB to the level necessary to support a radio switchover versus the savings from avoiding investing in and continuing analogue. In order to model the costs associated with the build-out of DAB to the level necessary to support a radio switchover, we have applied an average cost per transmitter based upon a mean of existing comparable sites. The average cost of £46,600 comprises assumed costs of £34,800 for Measured Transmission Services and Network Access, £8,200 for Distribution and £3,600 for Electricity. These estimates are in line with data provided by Arqiva, the company that supplies radio transmission infrastructure for the national networks.

The average cost is then applied on a region-by-region basis against the number of transmitters required to deliver FM comparable coverage in that area. The CBA assumes that transmitters are built in the two years prior to the commencement of switchover in each region, with the transmitters which deliver the greatest population coverage built first.

It is assumed in the CBA model that following a radio switchover all costs associated with national analogue transmission would cease following completion of radio switchover. At a local level the CBA assumes that local analogue costs, with the exception of those services continuing to be carried on FM, also cease after switchover. However, in all switchover scenarios the CBA accounts for some upfront decommissioning costs.

Further Producer Effects

Producer surplus, the difference between what producers are willing to supply a good for and what they receive, is not currently included in the CBA model. In a competitive market the benefits from increased sales of DAB radios to producers and retailers are expected to be largely competed away, especially in the medium and long-run. This is consistent with the approach adopted in the digital television switchover cost-benefit analysis. However, it is possible that there will be some increase in producer surplus as a result of increased DAB sales following a switchover announcement,

particularly in the short-run. **We seek further evidence on the extent of impacts of a radio switchover on radio manufacturers and retailers to inform the CBA.**

Digital Radio UK has indicated that there would be a significant marketing campaign of radio switchover following a switchover announcement. The costs from this marketing in terms of spend and foregone revenues from the use of advertising airtime are estimated by DRUK to be approximately £14 million in the year prior to switchover and £28 million in the year of switchover.

8. Modelling the Costs and Benefits for Wider Society

Released Spectrum

As a result of radio switchover, vacated analogue spectrum would become available for alternative uses. It is anticipated that AM spectrum would no longer be used for radio, and that some of the 20MHz FM spectrum would also become available.

Community radio is a possible use of the released spectrum. Ofcom license community radio stations subject to their meeting criteria relating to their contribution to the community. Over 400 applications have been received by Ofcom for community radio stations in total, with 231 applications successful over three round of licensing[25]. This suggests that there are a number of potential community radio stations that are not currently operational. Spectrum released as a result of radio switchover would allow a larger number of community radio stations to operate. The number of additional community stations that would follow switchover is uncertain. It is assumed for the CBA that the number of additional stations would be the difference between the number of applications and the number that have been successful. This is used as a proxy for the potential for extra stations rather than meaning that those stations that had previously unsuccessful applications would all become operational. Due to the time taken to apply for a licence and set-up community radio stations, it is modelled that the first additional stations commence broadcasting two years after switchover, with the remainder phased in over the following two years.

The social value of community radio stations is approximated by their median revenues[26], £44,500[27]. It is assumed that increased numbers of community stations would reduce the average revenue per station. This is because, assuming total radio listening does not increase, listening hours per station are likely to fall with an increased number of stations. This approach is consistent with that taken in the PwC cost-benefit analysis.

Community radio stations are only one use of part of the spectrum that would be released as a result of radio switchover. Another possibility is use of white space technologies such as Wi-Fi, but the extent of this possibility is somewhat uncertain. At this point in time, it is too uncertain to quantify the benefits from either white space technologies or other possible spectrum uses (beyond community radio). Ofcom have historically consulted on such issues and we will be working with

[25] Ofcom – Community Radio (2011)

[26] Median rather than mean revenue is used. This is because there a small number of larger community radio stations with comparatively high revenues that would likely migrate to DAB rather than remain on analogue. These stations inflate the current mean revenue of community stations and so the median is taken as more appropriate. Revenue is used rather than profit to approximate social benefit, as community radio stations operate on a not-for-profit basis.

[27] Ofcom – Community Radio (2011)

them to identify the appropriate mechanisms for assessing the associated benefits and whether they can be monetised for the CBA.

Disposal Costs

The London Economics (2011) consumer research investigates the costs of disposing of radio sets. These are relevant to the CBA because analogue sets will be disposed of as a result of radio switchover under the switchover scenarios. Costs are based on how consumers would dispose of analogue radios. In cases where consumers would not make additional trips to dispose of a radio set, their costs are relatively low. As shown in table 3, most respondents in the research stated that they would dispose of radios at a recycling site without making an extra trip.

Table 3: Means of Analogue Radio Disposal

Disposal Method	Share of Radios Disposed
Bin with usual rubbish	14%
Store at same time as purchase	2%
Store after purchase	1%
Recycling site with an extra trip	4%
Recycling site without an extra trip	53%
Keep it and store it away	9%
Sell it	2%
Donate it to charity	12%
Give it to family/friends	2%
Total	100%

Source: London Economics (2011)

These results are combined with estimates of the costs associated with the various disposal methods to estimate the costs across four stakeholders: consumers, producers, retailers and local authorities; as set out in table 4. Costs to local authorities include Landfill Tax in the London Economics research. This is a transfer to central government so would not normally be included for cost-benefit analysis. However, this can also be interpreted as a proxy for environmental impacts that are not included elsewhere in the model, such as embedded carbon in materials sent to landfill[28]. This cost is therefore included in the CBA.

The cost of disposal per year for each group is determined by the estimated number of radio disposals that result from switchover. This is closely aligned to the rate of digital radio take-up. However, it is likely that not all analogue sets will be disposed of, particularly as some radio services, such as community stations, will be available on analogue after switchover. Indeed, in the London Economics (2011) study, 9% of respondents stated they would keep "obsolete" radios after

[28] This alternative interpretation is proposed by Europe Economics in the independent review of the CBA, see Annex A.

switchover. The disposal of analogue sets may be spread over time and households with multiple radios may keep some of their analogue sets.

Table 4: Cost of Analogue Radio Disposal

Stakeholder Group	Disposal Costs (£/radio)[29]
Consumers	1.84
Local Authorities	0.08
Retailers	1.16
Producers	0.11

Source: London Economics (2011)

As with other assumptions, the sensitivity of the analysis to the relationship between digital radio take-up and analogue disposal will be investigated further for future iterations of the CBA. It may also be appropriate to test the assumptions underlying the estimated disposal costs per radio in the London Economics study as part of this sensitivity analysis. However, overall this is unlikely to be of primary importance to the CBA conclusions as the cost of disposal per radio is relatively low.

Energy Use and Environmental Effects

Differing energy usage of DAB and analogue radio sets may result in environmental impacts as digital radio take-up increases under the switchover scenarios. DCMS and Defra commissioned Intertek to model the energy usage of digital radio in comparison to analogue radio[30] under counterfactual and switchover scenarios to demonstrate the likely implications for energy consumption. The results from comparing these scenarios concluded that energy consumption is higher with digital radio than analogue. However, the difference in energy use between analogue and DAB radios has fallen, particularly for portable and table top radios in the Intertek research.

There are also implications for energy use from ceasing national analogue radio transmissions under the switchover scenarios. This results in a reduction in energy use in comparison to the counterfactual where both analogue and DAB transmissions continue. Furthermore, DAB networks can be much more energy efficient than analogue, particularly given that ten or more DAB services can broadcast on one frequency compared to one service per frequency on analogue. For example, total annual electricity use of transmitting the existing Digital One (D1) multiplex, which broadcasts national commercial DAB services, is less than 75% of the electricity for the analogue Classic FM network. As the D1 multiplex broadcasts thirteen services, electricity use per service is approximately 7% of that for the analogue Classic FM Network. On the regional and local DAB platforms, although the difference is not as marked, DAB consumption per service is approximately half that of the

[29] This is the cost per radio that causes disposal costs for the stakeholder group in question. Which stakeholder group incurs costs from the disposal of a radio depends upon the disposal method. See the London Economics (2011) paper for further details.

[30] Latest results comparing energy use of various radio receivers are available in: Intertek - Research Study of Energy Consumption of Digital Radios Upgrade, Issue 3 (2011)

analogue equivalent. It should also be noted that the efficiency of any replacement or future DAB transmitters will benefit from advances in DAB Transmitter technology over time.

The net environmental impacts associated with the switchover scenarios can be estimated in line with DECC guidance on valuation of changes in energy use[31].

[31] DECC – Valuation of energy use and greenhouse gas emissions for appraisal and evaluation (2011)

9. Sensitivity and Scenario Analysis

The values of the input variables for the CBA already discussed are subject to some uncertainty. In particular, forecasts of digital listening, DAB take-up and prices are increasingly uncertain further into the future. The precise value of the WTP for digital radio also cannot be known with certainty, not least because in practice this will vary across individual consumers. Sensitivity and scenario analysis will be used to test the results of the CBA. The implications of varying the time period over which costs and benefits are evaluated will also be assessed.

Sensitivity analysis tests how the conclusions of the CBA are influenced by altering key parameters one at a time. It can then be seen whether the conclusions are consistent as these inputs vary. For the estimated WTP, a range of values will be used, with the estimate of £41.82 likely to be used as an upper estimate for the reasons previously discussed. Further sensitivity analysis may also be explored with respect to the application of the WTP, drawing on the conclusions from the London Economics (2012) Supplementary Research. Similarly, the sensitivity of the conclusions to other key parameters can be explored, such as digital listening, take-up and prices.

For scenarios analysis, a range of parameters are varied simultaneously to construct alternative scenarios. For example, high and low case scenarios can be constructed to outline a range of plausible results. This can be conducted alongside the alternative switchover scenarios already discussed.

10. Conclusion

This methodology report outlines the approach taken for the cost-benefit analysis of radio switchover policy and highlights the key inputs to this analysis. The model uses estimates from various industry stakeholders and data derived from independent research commissioned to inform the analysis. Alternative market scenarios and sensitivity analysis around key inputs will be included with the CBA results to assess the robustness of the conclusions under various plausible assumptions. A relatively cautious approach has been taken for the central assumptions in the CBA, particularly with respect to the application of the WTP estimates that measure consumer benefits from digital radio and projections for the UK digital radio market.

To further ensure that the assumptions and data input into the model are robust, we are seeking views on the inputs and approach outlined in this report, with evidence to support any proposed changes. In particular, we invite views and further evidence with regard to:

- future trends in digital listening;
- future trends in household and vehicle digital radio ownership, with and without a switchover date announcement;
- future trends in household and vehicle digital radio prices, with and without a switchover date announcement;
- impacts of a switchover on vulnerable consumer groups; and
- impacts of a switchover on radio manufacturers and retailers.

Responses should be submitted to the DCMS by Friday 31st August 2012, either:

- by post to the Radio Team, 4th Floor, Cockspur Street, London SW1Y 5DH; or
- by email to CBARadio@culture.gsi.gov.uk

The cost-benefit analysis model will continue to be refined and updated going forward, taking on board any evidence submitted and additional evidence where appropriate, after which a further report discussing the results of the model will be produced.

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Annex A: Summary of Independent Model Review
Europe Economics

Europe Economics Report to DCMS

Independent Review: Government Cost Benefit Analysis of Digital Radio Switchover

Summary

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6 December 2011

SUMMARY OF MODEL REVIEW

1 Europe Economics (working in conjunction with Accent) was commissioned by DCMS to carry out a review of its cost-benefit model for digital radio switchover.

2 The model considers the following scenarios:

(a) A base case in which there is no digital radio switchover;

(b) UK-wide digital radio switchover in 2015;

(c) UK-wide digital radio switchover in 2019; and

(d) A phased digital radio switchover, in which switchover happens in England in 2017, in Wales in 2018, and in Scotland and Northern Ireland in 2019.

3 In each of the switchover scenarios, it is assumed that switchover is announced two years before it is implemented (with a separate announcement for different parts of the UK assumed in the phased scenario).

4 The model calculates the following impacts:[1]

(a) Consumer benefits from digital radio;

(b) Consumer costs incurred purchasing digital radios in-home and in-car;

(c) Producer costs from build-out of DAB transmitters;

(d) Savings in dual transmission costs;

(e) Switchover marketing costs;

(f) Costs of disposing of analogue radios; and

(g) Benefits from freed spectrum.

5 In the outputs sheet of the model, the incremental impact of each switchover scenario is calculated by netting off impacts which are experienced under the base case.

6 The model focuses on DAB radio, and does not take account of alternative platforms over which digital radio can be accessed (e.g. satellite, the internet).

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[1] In addition, DCMS intend to add in calculations of the energy and carbon costs arising from the higher energy usage associated with DAB radios.

7 The estimated consumer benefits are driven by estimates of consumer willingness to pay (WTP) for the attributes of digital radio, derived from a recent study by London Economics[2] and a previous study by PricewaterhouseCoopers.[3]

8 PricewaterhouseCoopers based its estimate of consumer WTP for digital radio on a review of the literature, but noted that new primary research was required. DCMS state that its mid-point figure of £35 per year is based on a BBC WTP study referenced by PricewaterhouseCoopers, but we have been unable to find the £35 figure either in the PricewaterhouseCoopers report or the BBC report that they reference.[4]

9 While the London Economics research was commissioned to address the need for primary research, a number of problems arise when attempting to apply its results in the cost-benefit analysis. Among other things, the following issues need to be taken into consideration.

10 The London Economics report does not separately identify the WTP of those consumers who have already purchased a digital radio and those who have not. It is the latter group which is most relevant when thinking about the impact of switchover, and one would expect consumers in this group to have a lower WTP. We advise that DCMS revisits the London Economics dataset to calculate WTP separately for these groups, taking account of coverage issues as well if possible.

11 London Economics compute the WTP for each digital radio attribute separately and then calculate the sum of these values as £42. However, it acknowledges that this figure should be treated as an upper-bound estimate, since consumers tend to value a bundle of attributes at less than the sum of the value of each attribute due to interaction and budgetary constraint effects. London Economics suggest a further contingent valuation survey should be undertaken, which we would also recommend. In the absence of this, DCMS might apply a scaling factor of 0.25 (i.e. a 75% reduction) to 1, with a central value of around 0.4 to 0.5, based on Accent's previous experience with WTP studies.[5]

12 Respondents to London Economics survey were given little context when responding to the choice experiment, which makes it difficult to interpret the results. In particular, it was not made clear to respondents whether:

(a) The cost they would incur was one-off or annual;

(b) The attributes of digital radio would be available in-home, in-car or both;

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2 London Economics, "Digital radio switchover: Consumer research to inform the cost benefit analysis", April 2011

3 PricewaterhouseCoopers, "Cost Benefit Analysis of Digital Radio Migration", 6 February 2009.

4 BBC & Human Capital, Measuring the Value of the BBC, 2004

5 It should be noted, however, that the design of London Economics' choice experiment was non-standard, in that respondents were never asked to trade off attributes of the new product against each other. Unfortunately, this raises a question mark as to how applicable scaling factors from other studies really are in this context.

(c) The attributes of digital radio would be available on just one radio set, or on all radio sets owned by the household;

(d) They should be responding as an individual or on behalf of their household.

13 All of these factors give rise to ambiguities as to how the WTP estimates should be used in the cost-benefit model. Ideally, the choice experiment would be redone, perhaps in combination with the contingent valuation survey recommended by London Economics, to obtain a WTP estimate which can be interpreted more precisely. If this is not possible, then DCMS will need to discuss with London Economics how best to interpret its results (e.g. based on what consumers said in focus groups). If necessary, DCMS could commission a cognitive testing exercise to understand how consumers interpreted the London Economics questionnaire.

14 The WTP to pay figure used for those who have not yet purchased a digital radio[6] should logically be lower than the cost of purchasing a digital radio (or bringing forward the purchase of a digital radio) in the base scenario in the years in which switchover happens in the other scenarios.

15 Moving on to the costs associated with purchasing DAB radio sets, we would make the following suggestions for improving the cost-benefit modelling:

(a) DCMS should consider valuing the consumer time associated with purchasing and tuning a DAB radio.

(b) It could be argued that consumers who are "forced" to buy a DAB radio set due to switchover are likely to choose a DAB radio towards the lower end of the price range. (That said, for consistency with the WTP estimate, the assumed price of a DAB radio must be sufficient to purchase a DAB radio with all the attributes that have been included in the WTP estimate.)

(c) For DAB radios in new cars, it is only the incremental cost of installing a DAB radio in place of an analogue radio which is relevant (rather than the full cost of installing a DAB radio).

(d) The way in which the price of DAB radios may fall through time could be modelled using the concept of "learning curves".

16 We also consider that that the relevant economic cost is the cost of bringing forward replacement of radio sets at the switchover date, rather than the full cost of a new DAB radio. For consumers who would eventually have purchased a digital radio, the model takes account of the DAB radio purchase cost that they would have incurred at a later

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[6] excluding those consumers who have been prevented from doing so due to being out-of-coverage.

date in the base scenario, but does not take account of the fact that by buying the radio set sooner under switchover they incur more years of depreciation on the new asset. For consumers who would have chosen to replace their existing analogue radio with another analogue one under the base case, the model does not take account of the fact that switchover leads to consumers avoiding this analogue replacement cost.

17 DCMS use an estimate of the additional advertising revenues that may accrue to community radio stations as a proxy for the social benefits of released spectrum. We consider that this proxy has a number of weaknesses, since it does not take account of the producer costs or wider social benefits associated with community radio, and neither does it take account of other potential uses of the spectrum (i.e. apart from community radio). We understand that Ofcom will be consulting on potential uses of this spectrum, which may yield information that allows this part of the cost-benefit model to be improved.

18 In the phased switchover scenario, we consider that switchover in England is likely to accelerate take-up of digital radio in other parts of the UK. There are various mechanisms by which this might occur, including reductions in the price of DAB radios due to switchover in England, manufacturers fitting DAB radios into new cars throughout the UK, and the potential for the marketing of digital radio switchover in England to influence consumers in other parts of the UK. DCMS may wish to address this through the take-up assumptions that it uses for other parts of the UK in this scenario.

19 Currently, the model only includes scenario testing for different WTP assumptions. Sensitivity and scenario analysis need to be carried out on a much wider range of input variables, focusing particularly on those variables which have a significant effect on the overall result and which are subject to most uncertainty. We understand that DCMS plans to carry out sensitivity and scenario analysis along these lines.

20 The model currently calculates incremental impacts only at the very end, when the net present value (NPV) of the base case is netted off the NPV of each of the switchover scenarios. In our view, it would be advantageous to calculate incremental impacts earlier in the modelling process, to allow the composition of incremental impacts to be identified more easily.

Annex B: Supplementary Consumer Research
London Economics

Consumer research for Cost-Benefit Analysis of Digital Radio Switch over

A supplementary report to DCMS

Prepared by

In association with YouGov

March 2012

About London Economics

London Economics is one of Europe's leading specialist economics and policy consultancies and has its head office in London. We also have offices in Brussels, Dublin, Cardiff and Budapest, and associated offices in Paris and Valletta.

We advise clients in both the public and private sectors on economic and financial analysis, policy development and evaluation, business strategy, and regulatory and competition policy. Our consultants are highly-qualified economists with experience in applying a wide variety of analytical techniques to assist our work, including cost-benefit analysis, multi-criteria analysis, policy simulation, scenario building, statistical analysis and mathematical modelling. We are also experienced in using a wide range of data collection techniques including literature reviews, survey questionnaires, interviews and focus groups.

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Terminology abbreviations

CBA	Cost Benefit Analysis
DCMS	Department for Culture, Media and Sport
WTP	Willingness-to-pay

1 Introduction

The Department for Culture, Media and Sport (DCMS) is currently undertaking a cost-benefit analysis to inform digital radio switchover policy. This report presents the results of consumer research undertaken by London Economics and YouGov during February and March 2012 in order to inform the DCMS cost-benefit analysis. The rest of this section sets out the aims of the project and the approach taken. The next two sections present the results of the fieldwork, and the final section draws conclusions.

1.1 Aims of the project

In early 2011, London Economics and YouGov conducted consumer research for DCMS in order to estimate consumers' willingness-to-pay (WTP) for the attributes of digital radio using a choice experiment methodology.[1] The aim of the current project is to provide a greater understanding of the WTP results from the 2011 study in order to clarify how these results should be interpreted and applied in the DCMS cost-benefit analysis.

In particular, the project needs to provide clarity regarding how respondents interpreted the original choice experiment with respect to four key areas:

a) Whether the cost they would incur was one-off or annual;
b) Whether the attributes of digital radio would be available in-home, in-car or both;
c) Whether the attributes of digital radio would be available on just one radio set, or on all radio sets owned by the household;
d) Whether they should be responding as an individual or on behalf of their household.

1.2 Approach

The approach used to address these requirements comprises of two elements:

1) A new sample of participants undertook exactly the same choice experiment as that conducted in early 2011, then answered a number of follow-up questions to explore how they interpreted the experiment in terms of the four key areas a) to d) above.
2) Twenty participants completed the same experiment and then, immediately afterwards, participated in telephone interviews to explore the interpretation of the experiment.

The first part provides quantitative data on the interpretation of the experiment for a sample of over 200 respondents, whereas the second part provides qualitative, in-depth evidence for 20 respondents. The two parts are discussed in turn below.

[1] The report from the 2011 research is available on the DCMS website: http://www.culture.gov.uk/publications/8136.aspx.

1.2.1 Online follow-up questions

A new sample of 221 participants undertook the same choice experiment as that conducted in early 2011. The wording of the experiment, including the introduction and the attribute descriptions, were unchanged from the earlier experiment. Likewise, the range of prices used was also unchanged (the wording can be seen in Annex 2).

In the original experiment, each respondent made eight choices. However, for the follow-up the number of choices per respondent was limited to four, since the purpose is to investigate how the respondents interpret the choice questions, rather than to re-estimate the WTP for each attribute.

Whereas eight choices per respondent was more appropriate before in order to create a larger dataset for WTP estimation, four choices per respondent is sufficient in order to allow follow-up questions to examine the interpretation.

After completing the choice experiment the respondents answered a number of open and closed follow-up questions in order to explore how they interpreted the experiment in terms of key areas a) to d) above. The follow-up questions can be seen in Annex 1.

The key advantage of this part of the study is that it provides explicit, quantitative information on how participants interpreted the choice experiment questions, based on a reasonable-sized sample of respondents that has been matched to the 2011 sample in terms if key demographic characteristics (see the sample characteristics below). Hence, the results from this element of the fieldwork can assist DCMS directly with inputs to their CBA model.

Online follow-up sample characteristics

The online follow-up sample was drawn from the YouGov panel of 360,000 UK adults, and the demographic composition was matched to those who took part in the choice experiment in early 2011.

The demographic characteristics of the online follow-up sample and the sample from 2011 are presented in Table 1. This comparison shows that the new sample is very closely matched to the original choice experiment sample.

Table 1: Online follow-up sample characteristics		
	Follow-up sample	Sample from 2011
Gender:		
Female	54%	51%
Male	46%	49%
Age group:		
18-29	19%	20%
30-39	17%	17%
40-49	17%	19%
50-59	16%	15%
60-69	13%	13%
70+	19%	15%
Region:		
East Midlands	9%	7%
East of England	12%	9%
London	12%	12%
North East	4%	4%
North West	11%	10%
Northern Ireland	2%	3%
Scotland	5%	8%
South East	16%	15%
South West	10%	10%
Wales	5%	5%
West Midlands	9%	8%
Yorkshire and the Humber	7%	9%
Socio-economic grade:		
AB	22%	22%
C1	31%	30%
C2	16%	15%
DE	30%	33%

Source: Follow-up choice experiment/original choice experiment.

1.2.2 Telephone depth interviews

An additional set of 20 participants completed the choice experiment and were interviewed by telephone immediately afterwards. The interviews lasted around 15 minutes and used a semi-structured topic guide to guide the discussion. The focus of the interviews was their interpretation of the choice experiment from the angle of the four key areas detailed previously.

By interviewing a number of consumers in depth we were able to explore their interpretation of the choices in an open and discursive manner. This provided them with the chance to state their interpretation spontaneously and, where necessary, through prompting with the interviewer acting as a neutral guide through the issues.

Sample characteristics of the Telephone interviewees

The 20 interviewees were sampled in order to provide a balance of men and women respondents, those living in both urban and rural areas, and cover a range of age groups. In addition, it was ensured that the sample included both digital radio owners and non-owners (Table 2).

Table 2: Telephone interview sample characteristics

Gender:	
Men	7
Women	11
Locality:	
Urban	12
Rural	6
Age band:	
18-29	4
30-39	3
40-49	3
50-59	3
60-69	4
70+	1
Digital radio ownership:	
Owns a digital radio	9
Does not own a digital radio	9

2 Results from the online follow-up questions

In this section we present the results of the online follow-up questions. The four sub-sections below examine the following:

- the interpretation of the price attribute,
- where respondents understood the attributes of digital radio would be available,
- the number of radio-sets on which the attributes of digital radio would be available, and
- where respondents answered based on their own preferences only, or those of their entire household.

2.1 Interpretation of the price attribute

This section aims to identify whether participants in the choice experiment interpreted the price attribute as a one-off or an annual cost. Two follow-up questions addressed this issue:

- When you saw the price displayed at the bottom of each option, what did you understand that price to represent?
- When you made this choice [referring to a specific choice made by the respondent], did you think of the price as being a one-off cost, an annual charge, or something else?

The first question was an open answer question, and referred to the choices that the respondents had just made in general.

The second question prompted respondents with possible answers including: a) 'one-off cost (like buying a radio)', or b) 'an annual charge (like a licence or subscription fee)'. Respondents also had the option to reply 'something else' (in which case they were asked to specify what they had in mind) or 'don't know'. This question was repeated for every choice made by each respondent.

Responses to the open answer question

The answers given to the open question by 48 respondents (i.e. 22%) clearly indicate that they interpreted the price as a one-off cost. This includes any respondents who reported that they interpreted the price to be:

- the price or cost of "the", "that" or "a" radio;
- the price or cost of the "set", "receiver", "hardware" or "item"; or
- a one-off-payment

Conversely, 29 respondents (i.e. 13%) gave answers to the open question which clearly indicate that they interpreted the price as a recurring cost. This includes any respondents who reported that they interpreted the price to be:

- a "yearly", "monthly", "ongoing" or "licence" fee (or price/cost);
- a subscription; or
- the cost of a "radio licence"

A further 20 respondents (i.e. 9%) reported that they interpreted the price as the price or cost of the "service", "package" or "plan". These responses also *suggest* that the respondents interpreted the price as a recurring cost since, in the context of media products, the words *service*, *package* and *plan* usually refer to something which is paid for on a recurring basis (such as a TV licence).

Responses to the closed (choice specific) question

First it should be noted that 83% of respondents interpreted the price attribute in the same way for all the choices that they made (see Table 3), suggesting that for most respondents the non-price attributes included in the choice did not influence the way that they interpreted the price attribute.[2] Among those who answered consistently, the majority (or 47% of the total) interpreted the price as a one-off cost.

Overall (i.e. over all the choices made), in most cases the price was interpreted as a one-off cost (54%), whilst for around a third of cases it was interpreted as an annual charge (34%).

Table 3: Price attribute interpretation

Price interpretation	Share of choices where price interpretation was 'consistent' over choices	Share of choices where price interpretation was 'inconsistent' over choices	Overall (i.e. over all choices made)
An annual charge	26%	7%	**34%**
One-off cost	47%	7%	**54%**
Something else	2%	1%	**2%**
Don't know	9%	1%	**10%**
Total	**83%**	**17%**	**100%**

Note: Respondents are defined as 'consistent' if they interpreted the price attribute in the same way across all choices that they made.
Source: Online survey choice experiment follow-up questions.

Secondly, this question also allows us to examine whether the interpretation of the price attribute varies according to the non-price attributes included in the choice (see Annex 2 for details of the choice experiment set-up).

Table 4 presents the shares who thought that the price referred to an annual charge, a one-off cost or something else, broken-down by the digital attribute tested. The interpretation is relatively consistent across the digital attributes. In every case the majority of respondents interpreted the price as a one-off cost.

[2] Among those who provided a clear response to the open answer question this percentage rises to 91%.

Table 4: Price attribute interpretation by digital attribute tested							
Price interpretation	D1: Tuning	D2: Display	D3: Pause/ Rewind	D4: No. of Stations	D5: Speciality Stations	D6: Sound	Overall
An annual charge	30%	30%	37%	32%	37%	35%	**34%**
One-off cost	56%	60%	53%	53%	51%	52%	**54%**
Something else	2%	1%	1%	5%	2%	4%	**2%**
Don't know	12%	9%	9%	10%	10%	10%	**10%**
Total	100%	100%	100%	100%	100%	100%	**100%**

Note: Shares of choices.
Source: Online survey choice experiment follow-up questions.

2.2 Where the attributes of digital radio would be available

This section aims to identify whether participants in the choice experiment understood that the attributes of digital radio would be available in-home, in-car or both. One follow-up question addressed this issue:

- Thinking about the choices you made, to what extent were you thinking about the radio listening you do at home or in the car?

This question was answered using a scale from 1 ('at home') to 9 ('in car'), where the mid-point (i.e. 5) meant 'both equally'.

The shares of respondents who gave each rating (from 1 to 9) are presented in Table 5 and Figure 1. The most common interpretation was that respondents considered the choices to be in the context of listening at home (i.e. 33% replied '1 - At Home'), followed by both at home and in the car equally, and then in the car (see Table 5 and Figure 1).

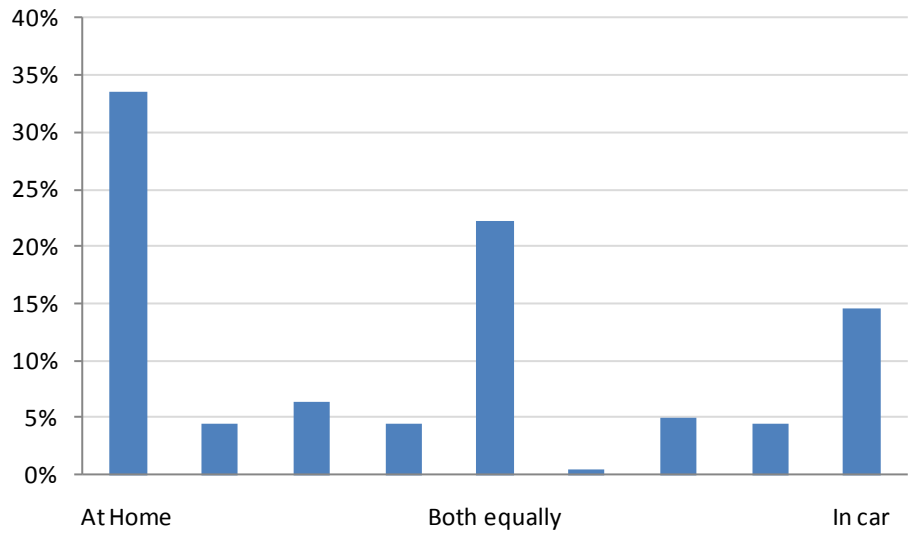
Around half understood the choices to be in the context of listening at home 'more' than they understood them to be in the context of listening in the car (meaning those who answered between 1 and 4, i.e. 33% + 5% + 6% + 5% = 49%).

Table 5: Where the attributes of digital radio would be available

Interpretation	Share of respondents
1 - At Home	33%
2	5%
3	6%
4	5%
5 - Both equally	22%
6	0%
7	5%
8	5%
9 - In car	14%
Don't know	5%

Note: Shares of all respondents.
Source: Online survey choice experiment follow-up questions.

Figure 1: Where the attributes of digital radio would be available



Note: 5% reported 'don't know'.
Source: Online survey choice experiment follow-up questions.

2.3 Number of radio-sets on which the attributes of digital radio would be available

This section aims to identify whether participants in the choice experiment understood that the attributes of digital radio would be available on just one radio set or on all radio sets owned by the household. One follow-up question addressed this issue:

- Thinking about the choices you made, did you think that the attributes of each option would apply to one radio set or all radio sets in your home/car?

The responses show a relatively even split between those who understood that the attributes would be available on just one radio set and those who understood that they would be available on all radio sets owned by the household (Table 6).

Overall, a slightly higher share interpreted the choices as referring to all sets owned by the household (44% vs. 41%).

In addition, the split is not greatly affected by whether an individual owns a DAB set, has digital radio in their car, or even listens to radio in the car.

Table 6: Number of radio-sets on which the attributes of digital radio would be available

		DAB set owner:		In car digital radio:		Listen in car:	
Interpretation	**Overall**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
All sets in home/car	**44%**	44%	44%	42%	55%	39%	46%
One radio set	**41%**	38%	43%	42%	33%	43%	40%
Something else	**1%**	0%	2%	1%	0%	0%	1%
Don't know	**14%**	19%	11%	15%	12%	19%	13%
Total	**100%**	100%	100%	100%	100%	100%	100%

Note: Shares of respondents.
Source: Online survey choice experiment follow-up questions.

2.4 Individual vs. household responses

This section aims to identify whether participants in the choice experiment responded as an individual or on behalf of their household. One follow-up question addressed this issue:

- Thinking about the choices you made, were you answering based on your own preferences or those of everyone in the household, including yourself?

The results show that overall a large majority of participants (76%) responded based on their own preferences only (Table 7). Intuitively, this is what we would expect given the wording of the choice experiment: the introduction refers to the "cost to you" and the attributes consistently

refer to "you" (rather than "you and your household").[3] This corroborates the evidence from the fieldwork that most respondents are replying as individuals.

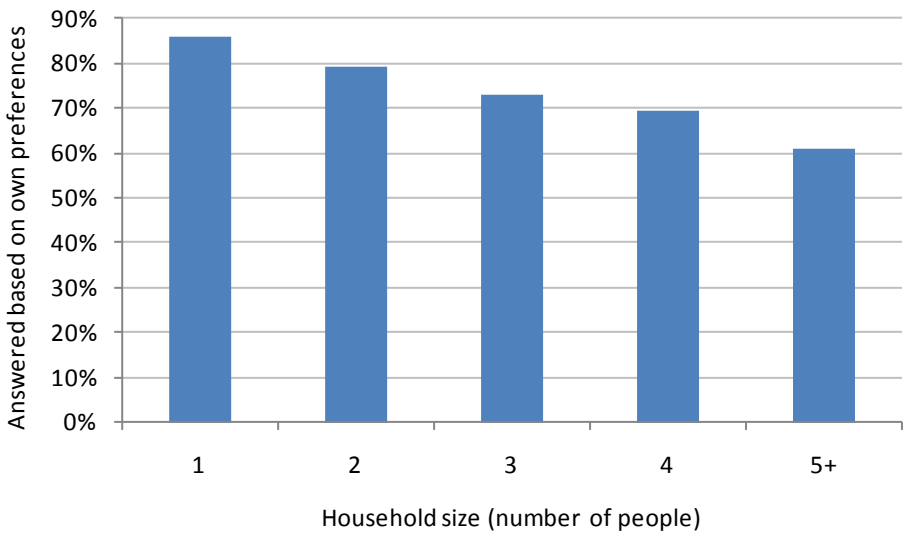
However, the breakdown by household size shows that the share basing their decision on their own preferences only decreases as household size increases (see Figure 2), as might be expected.

Table 7: Shares answering based on own preferences or those of whole household

Interpretation	Overall	Household size (number of people): 1	2	3	4	5+
Respondent's preferences only	**76%**	86%	79%	73%	69%	61%
Preferences of everyone in household	**20%**	9%	21%	22%	22%	28%
Something else	**0%**	0%	0%	2%	0%	0%
Don't know	**4%**	6%	0%	2%	8%	11%
Total	**100%**	100%	100%	100%	100%	100%

Note: Shares of respondents. Note that for some household size sub-groups the number of observations is quite small: the smallest is the 5+ sub-group for which there are 18 respondents.
Source: Online survey choice experiment follow-up questions.

Figure 2: Shares answering based on own preferences by household size



Note: Shares of respondents. Note that for some household size sub-groups the number of observations is quite small: the smallest is the 5+ sub-group for which there are 18 respondents.
Source: Online survey choice experiment follow-up questions.

[3] For example, "you have a choice of 20 national stations", "you can listen live and pause/rewind", "you have clear sound", etc.

3 Findings from the depth interviews

3.1 Interpretation of the price attribute

This section aims to identify whether participants in the choice experiment interpreted the price attribute as a one-off or an annual cost.

Spontaneous approach

To investigate this we use first used an open-ended and spontaneous approach which has the advantage of not leading the participants to think in terms of either on-off costs or recurring charges, but allowing them to reflect their interpretation back to us. The following question was used:

- First of all, when you saw the costs of each of the options – what did you understand the cost referred to?

Based on their answers to this first question, the participants can roughly be divided into three categories:

Category 1. Those who interpreted the price attribute as a one-off cost:

> *'I first thought it represented like, a monthly cost. Then I reread it and I thought, no, it's the cost of actually buying the physical radio equipment.' [Female, Carol]*

> *'I actually assumed that it was referring to a new digital radio set, or something. So, the purchase price.' [Female, Heather]*

Category 2. Those who interpreted the price attribute as a subscription fee that would have to be paid on an annual basis:

> *'I thought possibly that somebody was trying to find out how much we were willing to pay for a radio licence.' [Female, Kate]*

> *'I assumed it was an annual cost for the service provided, didn't include any piece of equipment. I also made the decision that that would be something that I wouldn't be interested in because it was too expensive. If it was something different from that, like a one-off payment, then I would think differently about it, or if it included some equipment with it then I might think differently about it.' [Female, Alison]*

Category 3. Those who were confused altogether by the price attribute:

> *'I presumed, well, I was a bit confused about it. I didn't know whether it was a monthly cost, weekly cost, yearly cost. The idea of actually paying for the radio. I didn't know what it referred to.'[Male, Geoffrey]*

'Well, I would've thought that that [paying this price] would've been at the time of purchase but then, thinking about it, it was probably an ongoing cost'… 'I think, possibly, it wasn't made clear, it could've ended up as a subscription cost, yes.' [Male, Damian]

Prompted approach

Secondly, when participants were then asked if the price attribute referred to a one-off cost or an annual cost, the answers were fairly even split between the two (Table 8).

Table 8: Interpretation of the price attribute – interim (18 interviews completed)

	Women	Men	All
One-off cost	5	6	11
Subscription fee	6	3	9
Total	11	9	20

Note: Number of respondents
Source: Telephone interviews

Women were more likely to think that the price attribute represented a recurring cost and they likened it to a 'radio license.' Other words that were used to describe this recurring cost were 'package' and 'services'.

'I would expect that the license fee would vary between the elements. Presumably that inside the license fee is an element for radio, even though we don't pay it separately, and I would expect that to increase from £30 to £33, £34, depending on the level of service that would be received.' [Female, Sandra]

Those in category 1 thought the benefits should last for the lifetime of the radio, which is what we would expect given the wording of the choice experiment: the introduction referred to "radio listening" in general, and several of the attribute descriptions are phrased as on-going benefits.[4] All participants expected a digital radio set to last at least five years and most expected it to last for much longer as it is perceived as an item where the benefits ought to last indefinitely.

'I would expect them [the benefits] to last as long as the product lasted. So, forever, or until it broke down and I got another one.' [Female, Heather]

Those in category 2 tended to think that the benefits would last for the duration of the subscription, whether that was a month or, more often, a year.

Analysis according to the individual benefits of digital radio

We then analysed each of the benefits (i.e. non-price attributes) individually by reviewing each of them with the participant and asking them if this was a benefit that would be part of a one-off cost

[4] For example D3 ("You can listen live, and pause/rewind broadcasts using your radio set") specifically refers to multiple broadcasts, and D2 says that if a person wishes to they "can re-order the list [of channels] to suit [them]", which is an attribute that someone would use in order to make it easier the next time that they came to use the radio.

or an annual recurring cost. Here it is worth bearing in mind that participants may not have seen all six benefits in the experiment due to random allocation across the respondents.

Table 9 summarises how participants perceived each of the individual benefits. Here we see some shifts from the initial unprompted answers given by participants (table 6): once they started to analyse individual benefits, some reached different conclusions about individual benefits relative to their initial response. Overall, there was a bigger shift by participants who initially thought the price attribute referred to a recurring cost, than by those who initially thought was that it referred to a one off cost.

Discussing the price attributes of the individual benefits sometimes made those who initially thought we were talking about a subscription fee confused as they were unsure how the benefits could apply to multiple radio sets. The fact that radio signals are currently free also added to the confusion.

> *[when discussing the number of stations] 'I don't know how that would work, so it couldn't be subscription, really, when you think about it, because you couldn't tell that that particular radio, unless you had a specific unit […] which was pre-programmed when you purchased it […] to receive particular channels, or however many you wanted to. Other than that, I mean radio waves are free now, wherever they are.' [Male, Damian]*

Table 9: Interpretation of the price attribute by non-price attribute – interim (18 interview completed)

Price interpretation	D1: Tuning	D2: Display	D3: Pause/ Rewind	D4: No. of Stations	D5: Speciality Stations	D6: Sound
One-off cost	14	16	13	10	6	15
Subscription fee	5	3	6	9	13	3
Confused	1	1	1	1	1	2
Total	20	20	20	20	20	20

Note: Number of respondents
Source: Telephone interviews

Respondents' ability to think about the six attributes as discrete benefits depended on the attractiveness of each (particularly compared to their current radio set) and, specifically, whether they could imagine paying extra for particular attributes. As the table above illustrates, the number of stations and the speciality stations benefits in particular are most often seen as 'something you subscribe to', not only by participants who thought all the benefits were part of a subscription fee, but also by some who thought all the benefits would come with the radio set as part of the purchase price. While some respondents would be willing to pay additionally to gain access to further radio stations most respondents thought this was something they either were not interested in or already had access to. So while respondents saw it as the sort of thing one would pay a recurring cost for (as they are familiar with this concept from television packages) most respondents were not willing to pay additionally for it and would prefer to choose whether to opt in or out especially if that meant the unit price could be kept down.

> *'To get a wider range of channels, that might be something I would be prepared to pay for regularly.' [Female, Kate]*

'It would be better if those channels are included in the price. However, if it meant the standard price had been bumped up, then that might put me off because I'm buying something that I don't want. So that would probably be better-, those channels would be better on a pay-per-listen basis. You know, like an annual fee.' [Female, Jenny]

'For the same reason I don't have Sky Sports or Sky Movies, I'm just not going to use it. It would be nice to be able to buy if, for example, I decided to improve my French, it would be nice to have French radio stations to listen to, to improve my French, yes.' [Female, Heather]

The sound was usually seen as something that would come with the radio set as part of the one off costs, even if participants thought the other benefits would be part of a subscription. Some thought the broadcaster (such as the BBC) had a key role in assuring the sound quality. Those who currently experience a poor sound quality (usually because of their geographical location) were most likely to be willing to pay additionally for a better sound quality.

'..out of all of them, that is the one that definitely should be guaranteed with the price that you pay at the beginning.' [Female, Jenny]

'These days I expect good sound, I expect good picture, I expect the best from whatever I'm buying, because if it doesn't provide the best, then I don't buy.' [Male, Damian]

'[…]at the moment, I don't get a good reception all around the house because I'm in a bit of a valley. If I could get good reception with no background noise, that would be-, across a range of stations that I enjoy listening to, that would be really appealing to me.' [Female, Alison]

There was a mixed response when it came to the tuning attribute, but the majority thought it would be a one-off cost as it would be a feature that would be built into the radio set. Most respondents currently already have this feature and would not be willing to pay additionally for it or very little.

'Given that it used to consist of a soft component of a variable resister and knob, a couple of quid, £2 maximum.'[Female, Heather]

The information display was something most participants thought of as a one-off cost, as it was often something they already had (often to a more limited extent) on their radio set. Some of those who initially thought that all the benefits would be part of a subscription were confused by this benefit, as it was something they could not imagine having to subscribe to. As such most respondents could not imagine paying additionally for it.

'I find that a bit difficult because my radio displays the station that you're listening to anyway, so I don't see how they could apply a cost to that. I don't really understand, but if I had to get-, and this is again right off the top of my head, I would say it would probably be in the cost of radio when you purchase the radio. So, it would be a one-off cost.' (Female, Kathleen]

The functionality benefit where you can pause and rewind broadcasts had the broadest appeal and was something participants were familiar with from TV services such as Sky+ and Tivo. It tended to be seen more as a feature of the radio set rather than something one would subscribe to. Though a number of participants thought this was a technical feature that one could be charged a recurring fee for. The willingness to pay for this feature was greater than for any of the other features. One respondent was willing to pay £10 additionally for this feature, whilst another respondent said she'd be willing to pay up to £40 for this.

> *'Again, I think that's a one-off. It's a one-off on your Skybox. […] I would expect it to be built into the component, or the piece of the kit and for it to continue for the life of the product.'* [Female, Heather]

> *'That's a very unusual thing to do in a sense, because radio sort of has listen again features and so forth, but to actually pause and rewind it is quite technologically complicated. So I would expect that that would be the sort of thing that people would sort of, if people did use it they would want to use it regularly and therefore there'd be a possibility of charging for it but not everyone would use it. So making it a one-off and available to everyone wouldn't make sense.' [Male, Daniel]*

> *'I would expect it to be built into the component, or the piece of the kit and for it to continue for the life of the product. […] I would be prepared to spend up to £10.' [Female, Heather]*

Finally, when we asked respondents to imagine going into a shop to buy a digital radio set, and to tell us how much they would be willing to pay for a new set, most answered somewhere in the region of £50 or less apart from a few exceptions who thought they had to pay an amount closer to £100. There was more disagreement as to how much more this was compared to an analogue radio set. While most respondents thought it would be at least 30 per cent more expensive some thought it would be up to 100 per cent more expensive.

> *'I was thinking like £80 to £100 for a digital one.' [Female, Emma]*

Most participants thought that they would hold on to this radio for a long time because they did not feel that the features of a radio set become outdated very quickly and would not see any need to replace a radio unless it had broken down. Overall they did not feel like they would be missing out on new technological developments if they were to hold on to a radio set for a long time.

> *'If it's working well, don't fix what's not broken.' [Male, Damian]*

3.2 Where the attributes of digital radio would be available

This section aims to identify whether participants in the choice experiment understood that the attributes of digital radio would be available in-home, in-car or both.

This was not something that participants were consciously thinking about whilst completing the experiment. However, in hindsight most answered that they were thinking more of listening at home than anywhere else, including some that also listen to the radio in the car. For many their mindset when completing the experiment mirrored their typical listening habits, but those who

were strongly certain that the cost represented a radio set tended to relate the choice to in-home listening.

> *'From the questions given, I had the feeling it was a one that you'd have in the house.' [Female, Jenny]*

> *'I was thinking about having it at home and just how useful it would be whether it would have everything that I listen to in here.' [Male, David]*

> *'Primarily in the house [...] in the car you wouldn't be able to operate it [the radio] in quite the same way. Some benefits would be more relevant in the home than in the car.' [Male, John]*

Respondents in Category 2 felt that the subscription would apply to all the radio sets in their household but were unsure how this subscription or 'license' would work outside the house, and were particularly confused as to how this would apply for a car radio.

> *Yes, I assumed that because we pay higher license fee that covers the entire house, that that would be the same situation, there would just be one license for the house. [Female, Sandra]*

Some would have answered differently if they had been thinking about using the radio in the car as certain benefits, particularly tuning, would be of more use in the car and they would be willing to pay more for this feature that they would not find as useful on a set in the home:

> *'Listening in the car, the tuning thing, you need something that will tune quickly. It's hard to press a button or be able to move quickly between one thing and other, whereas mostly at home it sort of stays between certain channels.' [Male, Geoffrey]*

> *'When I'm travelling around the country, the function where you can scroll through the different radio stations available, that would be very useful in the car.' [Female, Jenny]*

3.3 Number of radio-sets on which the attributes of digital radio would be available

This section aims to identify whether participants in the choice experiment understood that the attributes of digital radio would be available on just one radio set or on all radio sets owned by the household.

This section ties in closely with Section 3.2. The number of radio sets on which the attributes of digital radio would be available was not something participants thought about consciously when answering the questions. Many had to be prompted on this subject because it did not come up naturally. Those who thought the price attribute was a subscription thought it would be available on multiple sets in the house but they were unsure how that would work.

> *I've got no idea how it would work but I was assuming that the service would be available throughout the house, in some way, but I didn't really think that-, I just thought about using it in all of the different areas that I'd listen to the radio. [Female, Sandra]*

One participant who thought of the price attribute as a service that one could opt-in for assumed that you would be able to choose how many radio sets in your household it would apply to and pay additionally for multiple sets.

> *'I would think that this would be an option, you can either pay for one or two' [Male, Paul]*

Those who thought about the benefits as part of a one-off purchase price tended to think about one radio set and not multiple ones.

> *'I was thinking about something that I have not currently got. So it would be an additional radio set.' [Male, John]*

3.4 Individual vs. household responses

This section aims to identify whether participants in the choice experiment responded as an individual or on behalf of their household.

Most of the participants interviewed responded as an individual, either because they were living on their own, because they listened to the radio by themselves, or because they were more avid radio listeners than their partner.

> *'By myself, yes. It's a personal radio, yes.' [Male, Marcus]*

> *'99 percent of the time I am by myself in the car, so yes, I was just thinking about myself really.' [Male, Paul]*

To answer on behalf of yourself as an individual is the default way in which people tend to complete surveys and many of the instructions provided in consumer and social surveys explicitly ask respondents to do this. This is considered best practice because we cannot be sure of the accuracy with which they would represent the views of another person.

Those who listened to the radio with other members of the family tended to take their entire household into account when answering the questions. They approached the questions from the point of view of which benefits would appeal to them as well as their family members and how they could benefit from them together.

> *'I think I was considering what the benefit would be to both of us, because quite often we both want to know what the programme is, that is on, and what is coming up and what music is playing at the time, so yes.' [Female, Sandra]*

> *'I was trying to think about the whole situation because, obviously, because we do use it and we both listen together and, I mean, sometimes, when the children are there as well, they are as well, so we all, sort of, get to listen to it, so yes, thinking about the whole thing.' [Male, Damian]*

Most of those who listened with other people in the household but answered the questions from their own perspective said they probably would not have answered the questions differently had they been thinking about other members of their family.

4 Overall conclusions

In this section we set out the overall conclusions which can be drawn from the fieldwork with respect to the four key research questions.

Interpretation of the price attribute

Responses to the online follow-up questions show that a clear majority of respondents interpreted the price attribute to represent a one-off cost, and this is generally supported by the views expressed in the telephone interviews.

An interesting extension to this finding, from the telephone interviews, is that respondents who understood the price to be a one-off cost believed that the benefits should last for the lifetime of the radio (at least for five years and in most cases longer). Intuitively, this is what one would expect given the wording of the choice experiment: the introduction referred to "radio listening" in general, and several of the attribute descriptions are phrased as ongoing benefits.[5]

However, the share of online follow-up respondents and telephone interviewees who interpreted the price as a recurring cost was not insignificant. Therefore, it may be sensible to incorporate both interpretations in the cost-benefit analysis model, either as a sensitivity analysis or by applying some weighted average of the two.

According to the responses to the online follow-up questions, the interpretation of the price attribute does not seem to be greatly affected by the non-price attributes included in the choice. In particular, the shares of respondents who interpreted the price as either a one-off cost or a recurring cost did not vary much according to the digital attribute being tested (see Table 4).

To some extent this contrasts with the findings from the telephone interviews, which suggest that some digital attributes are typically associated with a one-off cost whereas others are associated with a recurring cost. However, this does not imply that during the choice experiment respondents would have interpreted the price attribute differently depending on the digital attribute being tested, since the views expressed in the interviews were given in retrospect and with prompted consideration and discussion.

Therefore, the simplest approach for the cost-benefit analysis modelling could be to apply a single set of shares to the total WTP estimate. Alternatively, attribute specific shares could be applied based on the percentages shown in Table 4 (though since these shares are relatively consistent across the attributes this may not have much effect on the overall outcome).

[5] For example D3 ("You can listen live, and pause/rewind broadcasts using your radio set") specifically refers to multiple broadcasts, and D2 says that if a person wishes to they "can re-order the list [of channels] to suit [them]", which is an attribute that someone would use in order to make it easier the next time that they came to use the radio.

Where the attributes of digital radio would be available

On balance respondents mainly considered the choices to be in the context of listening at home. This finding is supported by both the online follow-up and the telephone interviews. Excluding those who said 'don't know', over half the online follow-up respondents understood the choices to be in the context of listening at home 'more' than they understood them to be in the context of listening in the car.

However, there were clearly a range of interpretations, and in many cases the respondents had both scenarios in mind at least to some extent. Therefore, an appropriate way forward might be to apply some form of weighted average based on the figures presented in Table 5.

Interesting details coming out of the telephone interviews are that respondents often did not *consciously* think about either scenario when doing the choice experiment, and that if they had been thinking about using the radio in the car they might have been willing to pay more for certain digital radio attributes (such as the tuning attribute).

Number of radio-sets on which the attributes of digital radio would be available

Responses to the online follow-up questions show there is a relatively even split between those who thought that the attributes would be available on just one radio set and those who thought that they would be available on all radio sets owned by the household. Furthermore, the telephone interviews suggest that often this was not something that respondents consciously thought about when completing the choice experiment (which is also reflected in the relatively large share of 'don't know' responses for the online follow-up). Again it might be appropriate to incorporate both interpretations into a cost-benefit model, either as a weighted average or through sensitivity analysis.

Individual vs. household responses

According to the responses to the online follow-up questions a large majority of respondents based on their choices on their own preferences only, and this is supported by the findings from the telephone interviews. Intuitively, this is what one would expect given the wording of the choice experiment: the introduction refers to the "cost to you" and the attributes consistently refer to "you" (rather than "you and your household").[6] This corroborates the evidence from the fieldwork that most respondents are replying as individuals.

However, the breakdown by household size shows that the share basing their decision purely on their own preferences decreases as household size increases.

In this case, a potential modelling approach might be to model the costs and benefits on the assumption that all respondents answered based on their own preferences, and then apply an adjustment factor in order to account for those who answered based on the preferences of their entire household (maybe as part of a sensitivity analysis).

[6] For example, "you have a choice of 20 national stations", "you can listen live and pause/rewind", "you have clear sound", etc.

Annex 1 Online questionnaire

Part 1 – Choice experiment questions

To all:
**For the first FOUR questions you will be presented with a choice between Option A and Option B.
Option A includes a description of THREE aspects of radio listening and ONE associated cost.
Option B also presents THREE aspects of radio listening but ONE of them is different from Option A and there is a different cost.
Simply choose which one you prefer given the aspects of radio listening and the cost to you**

For each choice, three from the following list of six analogue attributes were included at random in one option:

A1: "The radio skips through all the available stations from one to the next, playing each one briefly, and you can stop it at the one you want. Alternatively you can turn a dial to find reception manually."

A2: "The only information provided on the radio set is the identification of the station you are listening to."

A3: "You can only listen to live radio as it is broadcast."

A4: "You have a choice of 10 national stations and between 5 to 25 local stations depending on your area."

A5: "You have a choice of around 5 to 10 specialty radio stations, such as stations in different languages, ethnic stations, stations for different religions, and speciality entertainment, sports and music stations."

A6: "You may experience sound interference."

In the alternative option, one of the analogue attributes was changed to the corresponding digital attribute among the following:

D1: "You can scroll through the names of all the available stations without hearing them and select the one you want to listen to from this list. If you wish to, you can re-order the list to suit you."

D2: "Information is continuously provided identifying the station you are listening to, what programme is on, and what song is playing or who is being interviewed."

D3: "You can listen live, and pause / rewind broadcasts using your radio set."

D4: "You have a choice of 20 national stations and between 5 to 40 local stations depending on your area."

D5: "You have a choice of around 20 to 30 specialty radio stations, such as stations in different languages, ethnic stations, stations for different religions, and speciality entertainment, sports and music stations"

D6: "You have clear sound and no background interference."

Part 2 – Choice experiment follow-up questions

1) When you saw the price displayed at the bottom of each option, what did you understand that price to represent?

[Open answer]

2) Thinking about the choices you made, to what extent were you thinking about the radio listening you do at home or in the car?
<1> 1 - At Home
<2> 2
<3> 3
<4> 4
<5> 5 - Both equally
<6> 6
<7> 7
<8> 8
<9> 9 - In the Car
<10> Don't know

3) Thinking about the choices you made, did you think that the attributes of each option would apply to one radio set or all radio sets in your home/car?
<1> One radio set
<2> All radio sets in your home/car
<3> Something else [open]
<4> Don't know

4) Thinking about the choices you made, were you answering based on your own preferences or those of everyone in the household, including yourself?
<1> Yourself
<2> Everyone in the household, including yourself
<3> Something else [open]
<4> Don't know

Note: Question 5) was repeated for every specific choice made by the respondent. The choices were re-shown to respondents as a prompt.
5) When you made this choice, did you think of the price as being a one-off cost, an annual charge, or something else?
<1> One-off cost (like buying a radio-set)
<2> An annual charge (like a licence or subscription fee)
<3 fixed> Something else [ic1a_open] {open}
<4 fixed> Don't know

Part 3 – Questions on radio listening

[q1] During an average week, on how many days do you listen to the radio (including listening at home, in the car, at work, via mobile phone, internet or personal stereo)?
<1> 7 days a week
<2> 6 days a week
<3> 5 days a week
<4> 3 or 4 days a week
<5> 1 or 2 days a week
<6> Less often than weekly
<7> Never / do not listen to the radio

Those who currently listen to radio
[q2] {multiple} How do you ever listen to radio? Please tick all that apply
<1> Analogue radio set – i.e. AM/FM/LW
<2> Digital radio set – i.e. DAB
<3> Through digital television
<4> Through the internet
<5> Another device - mobile phone, iPhone, MP3 player, MP4 player
<6> In-car/ van radio - analogue i.e. AM/FM/LW
<7> In-car/ van radio - digital i.e. DAB
<8> Another way
<9 xor>Not sure

Those who listen to radio at least once a week
[q8] {grid} And how many hours do you typically spend listening to radio in a week?
-[q8a] At home
-[q8b] In the car
-[q8c] Somewhere else

<1> None / not applicable
<2> up to 2 hours per week
<3> 3 to 4 hours per week
<4> 5 to 7 hours per week
<5> 8 to 14 hours per week
<6> 15 to 28 hours per week
<7> more than 28 hours per week

[q3_numA] {open-intrange 0 50} How many Analogue radio sets (i.e. AM/FM/LW) do you own? Please only include radio sets and not other ways you might listen to the radio, such as in-car radios, computers, mobile phones and television sets. If you don't own an analogue radio set type in 0.

[q3_numD] {open-intrange 0 50} How many Digital radio sets (i.e. DAB) do you own? Please only include radio sets and not other ways you might listen to the radio, such as in-car radios, computers, mobile phones and television sets. If you don't own a digital radio set type in 0.

Those who currently listen to radio
[q9] {multiple columns=4} Which, if any, of the following radio stations do you listen to for at least 30 minutes at least once a month?
<1> Absolute 80s
<2> Absolute 90s
<3> Absolute Classic Rock
<4> Absolute Radio
<5> BBC 1Xtra
<6> BBC Radio 1
<7> BBC Radio 2
<8> BBC Radio 3
<9> BBC Radio 4
<10> BBC Radio 5 Live
<11> BBC Radio 5 Live Sports Extra
<12> BBC Radio 6 Music
<13> BBC Radio 7
<14> BBC Radio Asian Network
<15> BBC World Service
<16> Capital Radio
<17> Chill
<18> Choice FM
<19> Classic FM
<20> Galaxy
<21> Heart
<22> Heat
<23> Jazz FM
<36> Kerrang
<24> Kiss
<25> LBC
<26> Magic
<27> NME Radio
<28> Planet Rock
<29> Punjab radio
<30> Q
<31> Smash Hits Radio
<32> Smooth UK
<33> Talksport
<34> The Hits
<35> XFM
<97 fixed> Other local commercial station [q9a_other]{open}
<98 fixed> Any other station [q9b_other]{open}
<99 fixed xor> None of these

#All who listen to digital radio
[q10] {multiple order=randomize} Which, if any, of the following features prompted you to get a digital radio set?
<1> A wider choice of radio stations (e.g. digital only radio stations)
<2> Clear and high quality sound / interference free
<3> Extra features (e.g. ability to pause and rewind live radio and programme guides)
<4> Scrolling text information about the programme (e.g. track and artist name, phone numbers, topics or guests)
<5> Ease of use (e.g. find your station by name, not frequency)
<6> Future proof / ready for switchover from analogue
<7> Got it as a gift
<8> Like new technology
<9 fixed> Other [q10_other] {open}
<10 fixed xor> Don't know

#All without digital radio
[q12] {multiple order=randomize} Which of the following, if any, explain why you don't have a digital radio set?
<1> Happy to use existing analogue service
<2> Too expensive generally
<3> Don't know why I should
<4> Don't listen to the radio / wouldn't use it
<5> Will get it when I have to / analogue signal switched off
<6> Poor reception in our area
<7> Not available in our area
<8> Can get it through digital TV / internet / mobile phone
<9 fixed> Other [q12_other] {open}
<10> Don't know

[q13] How likely are you to get a digital radio in the next year?
<1> Certain to get one
<2> Very likely
<3> Likely
<4> Unlikely
<5> Very unlikely
<6> Certain not to get one
<7> Don't know

[q14] Do you have a digital radio (i.e. DAB) in your car? If you don't have a car, tick that option below
<1> Yes
<2> No
<3> Don't have a car so not applicable

#Those with a digital radio in their car
[q15] Which of the following best applies when thinking about the digital radio in your car?
<1> You chose to have digital radio when buying a new car
<2> It was already installed in the car when you bought it
<3> You replaced the original analogue radio with a digital radio
<4> None of the above

#those who chose it as an option when buying a new car or replaced an original analogue
[q16] {multiple order=randomize} You said that you chose to have a digital radio in your car, which of the following reasons explain why?
<1> Number of stations available
<2> Access to special interest radio stations (e.g. languages, music or chat)
<3> Ease of tuning / easy to find stations
<4> Clear sound (less background interference)
<5> Consistent sound (no loss of signal when on the move)
<6> Good coverage across the country
<7> Extra functions on the set such as scrolling text (station name / DJ / songs)
<8> Like new technology in general
<9 fixed> Other [q16a] {open}
<10 fixed xor> Don't know

Those who do not have in-car digital radio
[q17] {multiple order=randomize} Why don't you have a digital radio (i.e. DAB) in your car?
<1> Too expensive
<2> Radio came with the car and happy with it
<3> Digital reception is poor in the car
<4> Prefer listening when I can concentrate
<6> Never thought about switching it to digital
<7 fixed> Other [q17_other]{open}
<8 fixed xor> Don't know

[q18] {dyngrid roworder=randomize} To what extent do you agree or disagree with the following statements? If you are not sure, please give your best guess.
-[q18_1] Digital radio...has more stations that are of interest to me than analogue radio
-[q18_2] Digital radio...has less reliable reception than analogue radio (loss of signal/ wavering sound)
-[q18_3] Digital radio...has a clearer sound than analogue radio (no background interference)
-[q18_4] Digital radio...is easier to tune/ find stations than on analogue radio
-[q18_5] Digital radio...is too expensive at the current time compared to an analogue radio
-[q18_6] Digital radio...sets have more useful functions than an analogue radio
-[q18_7] With digital radio...it is easy to catch-up if you miss a programme
-[q18_8] Digital radio...sets use less energy than analogue radios
<1> 1 - Strongly Disagree
<2> 2 - Tend to Disagree
<3> 3 - Tend to Agree
<4> 4 - Strongly Agree
<5> Don't know

Annex 2 Choice experiment set-up

The wording used in the choice experiment matched exactly that used in the choice experiment undertaken in early 2011. Box 1 presents the wording of the choice experiment introduction screen, and Table 10 presents the wording of the attribute descriptions.

For each choice respondents were asked to choose between two options, where one option contained a single digital attribute alongside two analogue attributes, whilst the alternative option contained the three corresponding analogue attributes.

Box 1: Choice expeiment introduction screen

For the first EIGHT questions you will be presented with a choice between Option A and Option B.

Option A includes a description of THREE aspects of radio listening and ONE associated cost.

Option B also presents THREE aspects of radio listening but ONE of them is different from Option A and there is a different cost.

Simply choose which one you prefer given the aspects of radio listening and the cost to you.

Table 10: Attribute descriptions used in the choice experiment

Digital attributes	Analogue attributes
Tuning:	
D1: "You can scroll through the names of all the available stations without hearing them and select the one you want to listen to from this list. If you wish to, you can re-order the list to suit you."	A1: "The radio skips through all the available stations from one to the next, playing each one briefly, and you can stop it at the one you want. Alternatively you can turn a dial to find reception manually."
Information display:	
D2: "Information is continuously provided identifying the station you are listening to, what programme is on, and what song is playing or who is being interviewed."	A2: "The only information provided on the radio set is the identification of the station you are listening to."
Functionality:	
D3: "You can listen live, and pause / rewind broadcasts using your radio set."	A3: "You can only listen to live radio as it is broadcast."
Number of stations:	
D4: "You have a choice of 20 national stations and between 5 to 40 local stations depending on your area."	A4: "You have a choice of 10 national stations and between 5 to 25 local stations depending on your area."
Speciality stations:	
D5: "You have a choice of around 20 to 30 specialty radio stations, such as stations in different languages, ethnic stations, stations for different religions, and speciality entertainment, sports and music stations"	A5: "You have a choice of around 5 to 10 specialty radio stations, such as stations in different languages, ethnic stations, stations for different religions, and speciality entertainment, sports and music stations."
Sound:	
D6: "You have clear sound and no background interference."	A6: "You may experience sound interference."

Annex 3 Choice experiment results

In this annex we compare the answers from the follow-up choice experiment with those from the original 2011 choice experiment, in order to check that the answers are broadly in line.

We do not repeat the full WTP analysis here since the limited number of observations from the new dataset means that the econometric results (and therefore WTP estimates) are not robust. Instead it is more appropriate to compare the shares of occasions where the digital and analogue options were chosen during the original experiment compared to during the follow-up.

Each time a respondent made a choice a different digital attribute was 'tested', meaning that that attribute was included in one of the options alongside two analogue attributes (see Annex 2)

The shares of occasions in which the digital and analogue options were chosen are presented in Table 11 (for the original experiment) and Table 12 (for the follow-up), according to the digital attribute being tested.

The tables present the shares for three different price differentials used in the choice experiment (i.e. the difference between the prices of the analogue option and digital option): £1 (i.e. the lowest differential used); £3 (i.e. the middle differential used); and £5 price (i.e. the highest differential used). The same results are also illustrated in Figure 3, Figure 4 and Figure 5.

Overall, the responses to the follow-up choice experiment questions are generally in line with those from the original experiment:

- The first point to note is that, as one would expect, the shares choosing the analogue option increase as the price differential increases (i.e. as the price premium a respondent would have to pay for the digital option increases). This is the case for every digital attribute for the 2011 data, and for most digital attributes for the follow-up data: Note that, since different respondents made choices over different (randomly allocated) bundles of attributes and price differentials, we would not necessarily expect to see the share choosing the analogue option always increase with the price differential, in particular for the smaller follow-up sample (because the smaller number of observations means that individual preferences may not average-out).

- Secondly, the respondents' relative preferences across the digital attributes seem to be reasonably in line when we compare the 2011 data with the follow-up data. In both cases there is roughly the same hierarchy among the digital attributes:

    - the *sound quality* attribute (Attribute D6) is the most attractive digital attribute, irrespective of the price differential (see Figure 3, Figure 4 and Figure 5), and
    - the *number of stations* and *speciality stations* attributes are the least attractive digital attributes, irrespective of the price differential, whilst
    - the other three digital attributes, which all relate to how the 'functionality' of the radio, lie in between these two.

Table 11: Shares choosing analogue or digital option, by dital attribute tested and price difference: ORIGINAL EXPERIMENT DATA

	Price difference: £1		Price difference: £3		Price difference: £5	
	Chose digital	Chose analogue	Chose digital	Chose analogue	Chose digital	Chose analogue
Attribute D1	66.2%	33.8%	59.7%	40.3%	50.5%	49.5%
Attribute D2	73.0%	27.0%	63.2%	36.8%	57.5%	42.5%
Attribute D3	80.1%	19.9%	70.6%	29.4%	59.5%	40.5%
Attribute D4	66.9%	33.1%	55.6%	44.4%	42.7%	57.3%
Attribute D5	62.2%	37.8%	47.2%	52.8%	41.4%	58.6%
Attribute D6	92.1%	7.9%	88.0%	12.0%	82.4%	17.6%

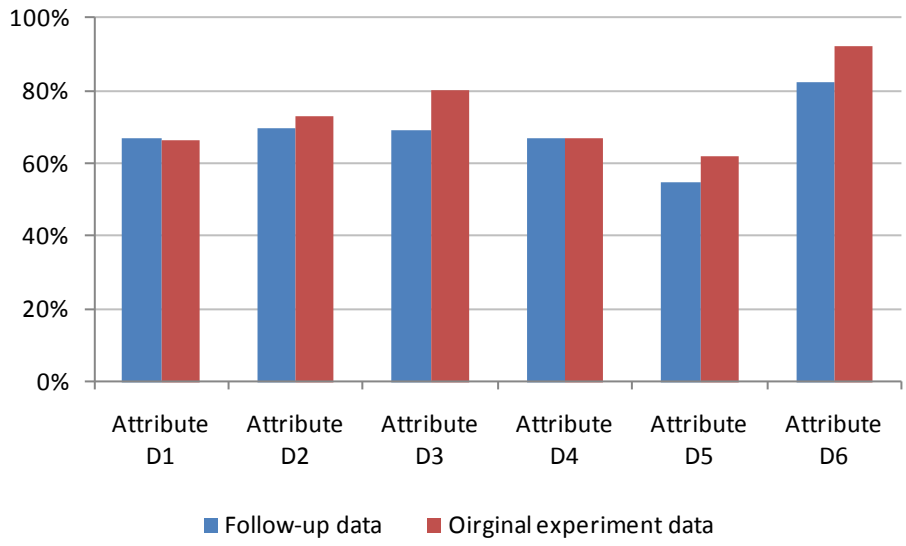
Source: Original choice experiment.

Table 12: Shares choosing analogue or digital option, by attribute tested and price difference: FOLLOW-UP DATA

	Price difference: £1		Price difference: £3		Price difference: £5	
	Chose digital	Chose analogue	Chose digital	Chose analogue	Chose digital	Chose analogue
Attribute D1	66.7%	33.3%	59.3%	40.7%	34.8%	65.2%
Attribute D2	69.6%	30.4%	48.4%	51.6%	57.1%	42.9%
Attribute D3	69.0%	31.0%	50.0%	50.0%	40.0%	60.0%
Attribute D4	66.7%	33.3%	33.3%	66.7%	24.0%	76.0%
Attribute D5	54.5%	45.5%	37.5%	62.5%	34.2%	65.8%
Attribute D6	82.1%	17.9%	84.6%	15.4%	87.5%	12.5%

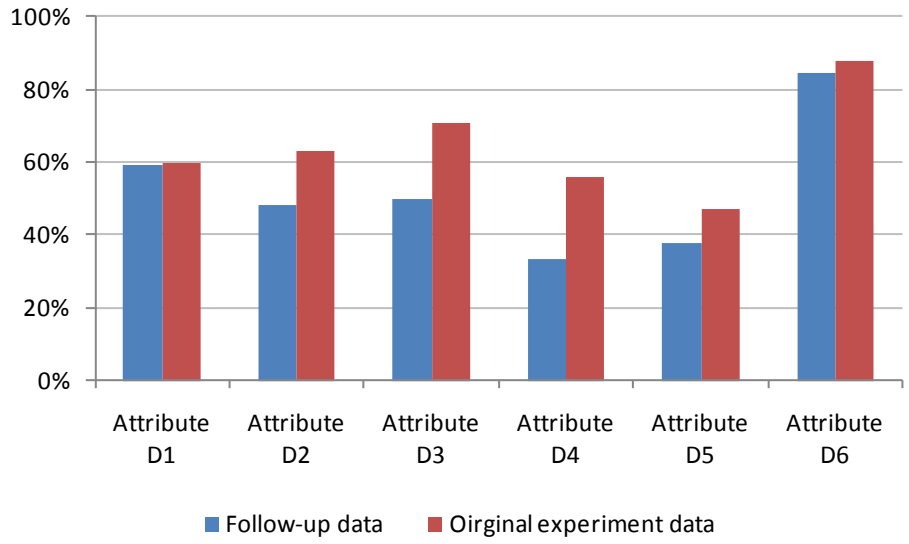
Source: Follow-up choice experiment.

Figure 3: Shares choosing analogue or digital option, by attribute: price difference = £1



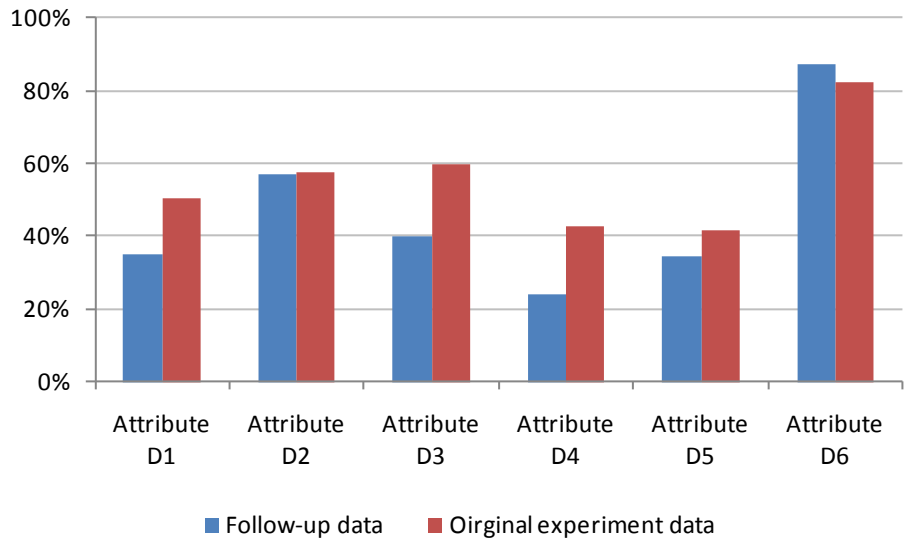
Source: Follow-up choice experiment/original choice experiment.

Figure 4: Shares choosing analogue or digital option, by attribute: price difference = £3



Source: Follow-up choice experiment/original choice experiment.

Figure 5: Shares choosing analogue or digital option, by attribute: price difference = £5



Source: Follow-up choice experiment/original choice experiment.

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