



cutting through complexity

An economic review of the extent to which the BBC crowds out private sector activity

A KPMG Report commissioned by the
BBC Trust

October 2015

FINAL REPORT



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Executive summary

The Department for Culture, Media and Sport ('DCMS') recently published the *BBC Green Paper*, a public consultation seeking views that will inform the UK Government's future decisions about the British Broadcasting Corporation ('BBC').

Does the BBC 'crowd out' private sector provision of broadcasting? And does the BBC website 'crowd out' the provision of local news by local and regional newspapers?

These are the questions that KPMG has been asked to investigate by the BBC Trust in the context of the Green Paper.

We focus, in our analysis, on a definition of 'crowding out' that is, we consider, both realistic in practice and that can be measured; what happens to the level of activity in commercial broadcasting, and to local newspaper readership and revenues, when the BBC's activity increases or decreases by amounts observed in recent history.

We do not try to ascertain what the commercial broadcasting or local newspaper businesses would have looked like had the BBC never existed, or how they would perform if the BBC ceased to operate in certain sectors. One is a hypothetical question that bears no relevance to choices that could be made today, and the other has not, as far as we are aware, been suggested as a potential policy decision.

The question is, rather, about the BBC's optimal size.

The concern being aired in the present debate is, in particular, that the BBC could be too large and might be engaged in activities to an excessive degree that would have taken place in the private sector anyway. If the BBC were reduced in size, so the argument runs, the private sector would step forward and generate the content. It would follow that the benefits from the BBC being there – in terms of provision of essential content that would not be provided at a low price by commercial channels – are actually low. Not for everything the BBC does, of course, but for the activities that the BBC potentially does to excess.

Consequently, our analysis focuses on questions relevant to the current debate (whether the BBC increasing or decreasing the scale of its activity is likely to have any discernible effect on commercial broadcasters or local papers' businesses) as opposed to theoretical questions (what the world would look like if the BBC were not there or, even, were reduced in size by a much larger amount than is realistic to assume).

We consider this crowding out question from an economic perspective. We look at historical measures of the size of the BBC and seek to establish the extent to which variations in the size of the BBC appear to affect the size of the commercial sector.

We have looked at three relevant measures of size when it comes to commercial television broadcasters:

- the amount of broadcast content consumed, measured by viewer hours;
- the amount of revenue generated; and
- the amount of that revenue which is spent on creating content (making programmes).

All three are, potentially, important to assessing the crowding out question.

What people choose to watch can be expected to be one of a small number of important drivers of the revenues earned by commercial broadcasters (whether from advertisers or subscriptions), their profits and, consequently, what they are willing and able to spend on the supply of content. If what

the BBC does affect commercial broadcasters' viewer hours, this might also be expected to impact on their revenues, profits and investments in programming.

Commercial broadcasters' profits (which cannot be measured as accurately from publicly available sources for the sector as a whole, in contrast to revenues which can be measured) are the ultimate objective of any commercial operator. It seems, therefore, a pertinent question as to whether a public service broadcaster ('PSB') is infringing on commercial organisations' ability to make profits from broadcasting in a way that might not be present in other sectors where profit-seeking businesses do not face similar competition from a large not-for-profit supplier.

Arguably, the most important measure of crowding out is the third, since one of the suggested purposes of shrinking the BBC is that more programmes should be made by the commercial sector.

KPMG has undertaken, in this report, an analysis of 'crowding out' in specific genres. In this study, we have been asked to look at the impact of the BBC on the provision, by private sector broadcasters, of news and entertainment.

We have also been asked to look at the impact of the BBC website on local newspapers. To do this, we ask questions similar to those set out above; has the growth of the BBC's online presence had any discernible effect on local newspapers' readership and / or on their revenues?

We have assembled data on the consumption of broadcasting, measured in viewer hours, from 2002 to 2014, for the commercial sector and for the BBC.

We have also collected data on the circulation, readership and revenues of local newspapers, together with BBC News website hits.

The report displays these time series in chart form, to allow the reader to judge whether the evidence supports the proposition that BBC activity 'crowds out' – i.e. is negatively correlated with – private sector activity.

We have also carried out a large number of econometric regressions, the purpose of which is to control for the other factors which influence the size of the commercial broadcasting sector. For each of the crowding out hypotheses that we were asked to test, we followed the same two-step econometric procedure:

1. we sought to find the equation which best explained the size of the commercial sector without including any variable which represented BBC activity; and
2. we then added, to our baseline equation, an explanatory variable which represented BBC activity (e.g. BBC spending on programmes in the relevant genre).

The econometric analysis of broadcasting estimates equations to explain commercial viewer hours and revenues. These are influenced by factors such as the quantity and quality of commercial programmes provided, which depends on the revenues available to finance them, which in turn depends on the state of the economy. If consumer spending is buoyant, advertising revenue will be buoyant, and the quality and quantity of commercial programming will expand. The question is whether, when all possible explanation of variations in commercial viewer hours have been included in the equation, the addition of a variable which captures the strength of competition from the BBC (e.g. BBC viewer hours) adds significantly to the explanation. If no significant BBC effect can be found, then there is no evidence of crowding out.

Similarly, if we find that the decline in local newspaper readership / circulation can be satisfactorily explained by variables such as the degree of Internet penetration, the growth of household incomes, advertising revenues, consumer spending and time trends that antedate the creation of the BBC website, with no significant correlation with the number of BBC News website hits, then we will have found no evidence of crowding out. If the number of BBC News website hits emerges from the regression with a significant negative coefficient, then we would conclude that crowding out has occurred in this market.

The general finding from our analysis is that there is no clear evidence, from the available data, that any increase (decrease) in the level of BBC activity has resulted in a decline (increase) in commercial broadcasters' viewer hours or revenues, or local newspapers' readership or revenues.

It would be a step too far to say that our analysis demonstrably proves there is no possibility that the BBC has, to some degree, crowded out commercial broadcasters' or local newspapers' activity. We can only assess whether actual changes in BBC activity have appeared to have any impact on commercial broadcasters or local newspapers. It might be that if the BBC were to increase or reduce the level of its activity by a larger degree than has been seen in the last 10-20 years, this might have a discernible effect on commercial broadcasters or local newspapers. But there is no way of knowing whether this would, or would not, be the case.

Also noteworthy is that the conclusions we reach, that there is little or no evidence that the BBC's activity does crowd out commercial broadcasters or newspapers, are consistent with a raft of other third party analyses, which we summarise in the literature review section of this paper.

Moreover, it is accepted (again, in a number of academic articles that we summarise in our report) that there are benefits that accrue to competition from public sector broadcasters like the BBC, as well as potential crowding out, including benefits in quality, innovation, and the provision of content that would otherwise not be supplied by commercial broadcasters alone. These would need to be set against any potential crowding out effects.

We now summarise the evidence that leads us to the conclusion that there is no clear evidence that the BBC's activity crowds out that of commercial broadcasters or newspapers.

Broadcast television: analysis of viewer hours

In these sections of the report, the hypothesis tested is whether an increase in consumption of BBC television broadcasts, measured by viewer hours per month, crowds out consumption of commercial broadcasting. The report examines two genres: entertainment and news.

Entertainment

The chart evidence (Figure 5, page 21) reveals (after abstracting from the strong seasonal pattern), a decline in BBC viewer hours from 2002 to 2005, stability from 2005 to 2009 and a strong rise between 2009 and 2011 to a higher level which is then sustained.

Commercial viewer hours in the 2002-05 period are stable or declining.

After 2005, they rise and in 2011 they rise again. So commercial entertainment viewer hour rose in the last years of the boom, were stable in the recession and rose again as the recovery took hold.

There is, thus, a strong *positive* correlation (evidence not consistent with crowding out) with BBC viewer hours from 2007 to 2014 (flat in the recession, rising in the recovery) and a weak negative correlation between 2002 and 2007 (when BBC viewer hours fell a little and commercial viewer hours rose by very much more).

Our econometric analysis confirms that there is no firm, statistically significant, evidence that any increase (decrease) in the BBC's activity results in a reduction (increase) in commercial broadcasters' viewer hours in the entertainment category.

Broadcast news

Consumption of news broadcasts (viewer hours per month) shows a much less pronounced seasonal pattern than entertainment, with spikes associated with by big new events (e.g. the Iraq war).

Commercial broadcast news viewership has been in continuous steady decline since 2006.

BBC news programmes consistently attract more viewers than commercial news channels in the data analysed but since 2003, consumption of BBC news has been broadly stable while commercial news consumption was declining.

Since 2010, the BBC has also seen lower consumption of its news programmes.

The overall picture that emerges (see Figure 7, page 22) is that commercial news has been steadily declining while BBC news has been flat or very slightly declining. Any correlation between the two series is positive and the data, thus, provide no support for the crowding out hypothesis.

Our econometric analysis, like with the entertainment category, confirms that there is no firm, statistically significant, evidence that any increase (decrease) in the BBC's activity results in a reduction (increase) in commercial broadcasters' viewer hours in the news broadcasting category.

Analysis of revenues and spending on programmes (in real terms, £m at 2014 prices)

This section of the report focuses on incomes and programme spending.

Figure 8 (page 23) shows how broadcasting revenues from all sources have evolved since 2008.

BBC revenue allocated to television increased between 1998 and 2004 but has been in decline since.

Total commercial broadcasters' revenues, in contrast, increased rapidly, by an average of 3.1 per cent a year, in real terms, between 1998 and 2014. There was, over this period, a marked change in the composition of those revenues. Advertising revenue increased between 1998 and 2005 but have been in decline since 2005, by an average of 2.1 per cent a year in real terms. By contrast, subscription revenues have risen throughout the period, by an average of 7.3 per cent a year, in real terms, since 1998, and are now comfortably the largest source of broadcasting revenues.

The clear message from Figure 8 is that the strong increase in subscription revenue from 1998 to 2014 has swelled total revenue available to spend on television broadcasting, despite the decline in advertising revenues since 2004.

The strong growth in commercial television operators' revenues in real terms, therefore, suggests that there is no evidence that any change in the BBC's activities have damaged commercial television operators' commercial performance¹.

BBC online and local newspapers

The circulation of local newspapers has been in decline since 2001, with a clear acceleration in the pace of this decline taking place after the economic crisis struck in 2007 (Figure 15, page 32).

Local newspapers' revenues show a similar pattern, rising between 1996 and 2004 (despite declining circulation) when the economy was strong, and falling from 2007 onwards after the recession struck.

However, Figure 15 reveals that the downturn in advertising revenues was already underway, in 2005, while the economy was still strong.

One possibility is that this decline is, at least in part, attributable to the rise in Internet penetration, which increased from nearly a third of all households in 2001 to 85 per cent of households in 2014. The Internet provides users with access to much of the information that was previously sourced from local newspapers.

¹ The revenue data was only available on an annual basis, giving only 14 observations; not enough for a robust econometric analysis. Any regression results we were able to produce were consistent with the hypothesis that any reduction in BBC revenues would have no effect on the revenues available to commercial broadcasters. We do not, however, consider that the available data are sufficient for a regression analysis to be relied upon in this area, either to prove or disprove crowding out.

Another possibility is that the increase in the provision, and use of, BBC news online can, at least in part, explain the decline in local newspapers' readers and revenues. Statistically and graphically (Figure 16, page 33), it is difficult to isolate the effect of the growth of BBC online from the general growth of the Internet. This is because there is a very strong positive correlation between the growth in BBC News website hits and the growth of Internet penetration.

The numbers, therefore, need to be considered alongside other, more qualitative, information.

In particular, an analysis of the impact of the BBC on local newspapers should be mindful of the fact that the BBC's News website overlaps only with a subset of the content and services provided by local newspapers:

- Local newspapers' news coverage tends to be more localised than the BBC News website's local news coverage. Although there is some overlap in the news content provided by local newspapers and the BBC, local papers provide a significant amount of additional content that is simply not available from the BBC website.
- It is not only the BBC that reports news online at a local level in the UK. A number of other commercial news providers offer websites supporting similar services, including local papers themselves. Clicks on these websites, as well as on the BBC, could potentially have affected local newspaper circulation.
- As the Internet has grown, the way that people share information has changed. The advent of Facebook, Twitter, MySpace, Instagram, and a multitude of specialist websites now allow people with niche interests to share information quickly and at a low cost with like-minded people. Local newspapers still have a role, but the information they convey can now be shared in numerous different ways; something not possible even a decade ago. These services are not provided by the BBC or by other online news providers. Yet they increasingly pose a threat to the unique content provided by online papers.
- A prominent service of local newspapers is to allow local businesses to advertise to local people and individuals to post classified advertisements. No BBC website offers such services. Arguably, however, a large number of non-BBC websites do offer people the opportunity to conduct these alternative functions online (e.g. eBay, Rightmove, Gumtree, eHarmony). Potentially, this multitude of websites allow local business and individuals to reach a larger, yet still targeted, audience than was possible with local newspapers and at lower cost. For that reason, a feasible hypothesis must be that the growth in general Internet usage has been responsible for a consumer shift away from local newspapers and towards other forms of information sharing, even at the local level.

For these reasons, there is good reason to suppose that the increased adoption of the Internet, and the way we all share information across it, has had a larger effect on local newspapers' performance than the growth of the BBC online in isolation. Our econometric analysis, which attempts to discriminate between the two effects, appears to corroborate this view.

Our econometric analysis of local newspaper circulation and advertising revenues found that the decline in both can be explained by a combination of the economic recession and long period of slow growth which followed, and the steady rise in Internet penetration. The BBC's online presence (i.e. BBC News website clicks) had no statistically significant effect when added to this equation.

This conclusion is consistent with the experience of other markets which are not characterised by competition from large PSBs. For example, in the United States, Sunday and daily newspaper circulation has declined in ten and eleven of the last twelve years respectively. Furthermore, between 2008 and 2012, the International Federation of Audit Bureaux of Circulations ('IFABC') data suggest that circulation has fallen for almost 65 per cent of paid regional and local newspapers across twelve member countries and for more than 85 per cent of paid regional and local titles across sixteen member countries.

1

DCMS considers in its Green Paper whether the BBC crowds out commercial media

The Department for Culture, Media and Sport ('DCMS') recently published the *BBC Green Paper*²; a public consultation seeking views that will inform the UK Government's future decisions about the British Broadcasting Corporation ('BBC').

The four areas identified as the focus of the Green Paper are the BBC's:

- mission, purpose and values;
- scale and scope;
- funding; and
- governance.

The Green Paper outlines that when assessing the scale and scope of the BBC, it is important to assess not only the range of services, audiences and content mix of the BBC, but also the BBC's impact on the rest of the UK media sector.

The Green Paper acknowledges that the BBC may have had some positive effects on the media sector. For example, it states that the BBC may have encouraged: high standards of content; investment in independent production; and the development of media distribution infrastructure.

However, the Green Paper also notes that there have been some concerns raised that, due to its high level of public funding, the BBC might hold an unfair advantage over its competitors. The consequence could be for some commercial broadcasting and media business models to potentially be undermined (i.e. it may 'crowd out' private sector activity).

The Green Paper outlines a number of specific areas that may be of concern when considering the impact of the BBC on the media sector. These include:

- Television: the commercial television sector may struggle to compete with freely distributed content. The Green Paper uses the example of BBC News 24 and how its introduction in 1997 may have affected other news providers including Sky News, Channel 4 and ITV.
- Radio: concerns have been aired that, unless commercial advertising revenues remain robust, the BBC's radio market share could continue to grow.
- Online news provision:
 - the popularity of the BBC News website could impede the ability of other UK news outlets to develop profitable business models such as paywalls and subscriptions; and
 - local newspaper readership has declined in recent years due to a number of factors including the introduction of new technologies, changing consumer behaviour, loss of advertising and other market pressures, of which the BBC could be considered one.
- Cross-promotion of services: the BBC's ability to cross-promote its own services could also have an impact on the wider media market.

The BBC Trust has commissioned KPMG to undertake an independent economic review of the extent to which the BBC crowds out private sector activity. Our economic review evaluates evidence on the extent to which the BBC crowds out private sector activity in the television broadcasting and local newspaper markets.

For television broadcasting, the foci of our independent review are the news and entertainment genres. We have considered these genres in particular since they form part of the BBC's stated public purposes and remit³, and are, to some degree, mentioned in the Green Paper with respect to crowding out.

2 An economic framework to assess crowding out in the local newspaper and television broadcasting markets

2.1 Crowding out is a concern that should be considered alongside potential countervailing positive effects

In the provision of UK public service broadcasting, the term ‘crowding out’ refers to the BBC’s activities replacing similar activities that would be provided by private sector firms.

It prompts two questions:

1. Firstly, if the BBC were smaller how may the private sector respond? Would they decrease, maintain, or increase their supply of content?
2. Secondly, if private providers increase their supply of content, would they do so to a greater or lesser extent than any reduction in BBC activity i.e. might overall supply in the marketplace increase or decrease in size if the BBC were to be scaled back?

Our analysis assesses the BBC’s impact on commercial news and entertainment broadcasters and local newspapers when there are changes in the level of the BBC’s existing activities in these genres.

This is the only question that we can answer with respect to crowding out based on actual historical data.

Any assessment on how the market may react if the BBC ceased to exist / never existed in certain areas of operation can only be based on hypothetical and theoretical analysis, since the UK market has never undergone such an experience.

For these reasons, we have focused our analysis to marginal historical variations of BBC activities that *can* be tested and how they have affected our focus markets.

2.2 We have evaluated whether the BBC crowds out private sector activity, based on academic literature and available data, by testing a series of hypotheses in news broadcasting, entertainment broadcasting and local newspaper readership

Our analysis focuses on a historical assessment of how the BBC’s activity in news and entertainment broadcasting and local news might have affected private sector provision of the same or similar content, controlling for all other potential influencing factors on private sector activity (e.g. economic, demographic and technological changes).

Our approach relies on three components to make an assessment on the extent to which the available evidence is consistent with the notion that the BBC crowds out private sector activity in these markets:

1. a comprehensive review of academic papers focusing on how crowding out by public service broadcasters (‘PSBs’) across media markets has been addressed and tested by other experts and commentators (including academics and other consultancies) (Section 3);
2. an analysis of how measures of commercial broadcasters’ activity that may reflect any instances of crowding out have evolved over time (Sections 4 and 5); and

3. an econometric analysis⁴ to diagnose the extent to which there is evidence, based on the available data, that the BBC crowds out private sector activity in the genres and markets of interest (Sections 4.5 and 5.2).

We consider, in the rest of this section, the economic rationale behind our approach to measuring and assessing the degree of possible crowding out in news and entertainment broadcasting and the local newspaper market.

2.2.1 Approach to analysing broadcast news and entertainment content

We have considered three ways to measure the extent of crowding out of news and entertainment television broadcasting:

1. how the volume of viewer hours changes with the supply of content by the BBC;
2. how commercial revenues (from both subscription and advertising) changes with BBC revenue from the licence fee; and
3. how expenditure by private firms on supplying content changes with BBC expenditure on the same content.

We have conducted our analysis at the genre level for viewer hours. We have asked what might happen if the BBC produced:

- less news / entertainment programming, would the private sector get more revenue, expand its production of news / entertainment and, as a consequence, achieve higher audience numbers?; and
- less broadcast news and news website content, would the private sector get more revenue and expand its production of local news content?

We have, where the data allow, also considered private firms' expenditure at the genre level. However, commercial broadcasters' revenues are available only at an aggregate level; this is, not least, because both advertising and subscription revenues (together the clear majority of commercial broadcasters' revenues) are common across multiple genres.

We now consider the three measurements in further detail.

2.2.1.1 Viewer hours

The BBC competes with commercial broadcasters directly for viewers.

If the BBC were shrunk, it seems plausible that commercial audiences might expand.

Our analysis tests this proposition by analysing whether there has been a material and statistically significant negative relationship between BBC and commercial broadcasters' viewing hours for news and entertainment.

Our econometric analysis, based on the available data, aims to assess the extent to which commercial audiences vary with changes to the quantity of BBC viewer hours. The analysis quantifies the impact of other potential drivers of commercial viewer hours, such as, and not limited to, advertising revenues, subscription revenues, and economic activity⁵ which may also impact on commercial viewer hours. Once the impact of other possible and observable explanatory factors of variation in commercial viewer hours has been established, our regressions determine whether changes in BBC viewer hours can be seen to have any significant (both statistically and in terms of magnitude) impact on commercial viewer hours. If there is no significant explanatory impact from a

4 Regression analysis is a statistical technique that estimates how one variable (the 'dependent' or 'explained' variable) responds to changes in more than one other variables (the 'independent' or 'explanatory' variables) based on a sample of observations for the variables in the regression equation.

5 For example, the quantity and quality of commercial programmes provided might be a function, in part, of the revenues available to finance them, which in turn depends on the state of the economy. If consumer spending is buoyant, advertising revenue will be buoyant, and the quality and quantity of commercial programming should, as a result, expand.

BBC effect measure, then this is consistent with there being no evidence of crowding out based on the available data.

This analysis is divided between entertainment viewer hours and news viewer hours.

2.2.1.2 Revenue

Commercial broadcasters' revenues (which can be measured) and their profits (which cannot be measured as accurately from publicly available sources for the sector as a whole) are the ultimate objective of any commercial operator. It seems, therefore, a pertinent question as to whether a public sector broadcaster is infringing on commercial organisations' ability to make profits from broadcasting in a way that might not be present in other sectors where profit-seeking businesses do not face similar competition from a large not-for profit supplier.

The same principles outlined in Section 2.2.1.1 can be applied to changes in private sector and BBC revenue.

However, this analysis has to be conducted at aggregate level. Advertising revenues are not collated in a manner that will allow such analysis to be performed⁶ and satellite television subscriptions are for a bundle of programmes across multiple genres.

Based on the available data, we explain the impact of the explanatory variables on commercial revenue streams (advertising plus subscription). The explanatory variables include economic activity, consumer spending and BBC licence fee income. The primary purpose of this equation is to answer the question: how would commercial revenue change if BBC revenue were to decrease?

The analysis assesses the total level of BBC vs. private sector (both subscription and advertising) revenue.

2.2.1.3 Spending on programmes

Arguably, the most important measure of crowding out is commercial broadcasters' expenditure on programming.

One concern being aired in the present debate is that despite the potential benefits attached to the BBC's activities, is it the case that the BBC is too large and might be doing things to an excessive degree that would have taken place in the private sector anyway? If the BBC was reduced in size, so the argument runs, the private sector would step forward and generate the content, and more programmes would be made by the commercial sector.

Our analysis seeks to assess whether there is any evidence that affirms this view.

Consistent data reported by genre over a frequent and long time period across broadcasters are not available⁷.

As a consequence, our analysis focuses not on programme expenditure at a genre level, but at an aggregate level for the private sector.

In addition, our econometric analysis tests whether commercial broadcasting revenues are affected by the size of the licence fee itself, and by the amount of that fee spent on entertainment/news programmes, or both.

6 In part because it is conceptually difficult to do this; what genre would you apportion advertising revenues to for commercials aired between The X-Factor and the News at 10pm?

7 These data are not made readily available publicly for the commercial sector over a sufficiently long time period for us to draw any inference. There are some data for some multi-channel broadcasters.

2.2.2 Approach to analysing local print news and BBC activity

Our approach to assessing the impact of BBC activity on local newspapers follows a similar pattern to our analyses of broadcast media.

We assess the extent to which local newspaper circulation and revenues vary with changes to, for example, BBC activity in local news by using hits on the BBC News website as a proxy for hits on local news webpages on the BBC website.

Any statistical assessment of the BBC's impact on local newspapers must be conducted being mindful of the fact that the BBC's News website overlaps only with a subset of the content and services provided by local newspapers:

- Local newspapers' news coverage tends to be more localised than the BBC News website's local news coverage. It is not uncommon for local papers to report on events, marriages, deaths, and sporting events for individual small towns or boroughs. By contrast, the BBC News website reports local news stories down to county and city level. Whilst there is some overlap in the news content provided by local newspapers and the BBC, local papers provide a significant amount of content that is not available from the BBC website.
- It is not only the BBC that reports news online on a local level in the UK. ITV, for example, has a website that offering a similar local news service. Clicks on these websites, as well as on the BBC, could potentially have affected local newspaper circulation. It has not been possible for us to collate data over a time series for hits from websites other than the BBC News website, so we cannot test this proposition. We note, though, that like the BBC, none of the other commercial news providers – other than the local papers themselves – provide as comprehensive highly local news online as has traditionally been provided by the local newspapers.
- As the Internet has grown, the way people share information has changed. The advent of Facebook, Twitter, MySpace, Instagram, and a multitude of specialist websites now allow people with niche, special interests to share information quickly and at low cost with like-minded people. Schools no longer have to rely on the local paper to share the results of their prize day and exam results; apps such as ParentMail and the school website allow them to do so at the click of a button. People now post their wedding pictures on Facebook instead of in their local weekly newspaper. The under 11 football team 'Tweets' its results to anyone who might be interested – you no longer have to rely on the local paper for this information. And so on. Local newspapers still have a role and remain popular among their readership. But the information they convey can now be shared in numerous different ways; something not possible even a decade ago. None of these services are provided either by the BBC or by other online news providers. Yet they increasingly pose a threat to the unique content provided by online papers. It is hard to believe that the growth of the Internet, and the rapidly changing way people share niche information, has not had a significant impact on the use, and future, of local newspapers. For this reason, we consider in our analysis the possibility that the general growth of the Internet is likely to have had a larger effect on their readership than the growth of the BBC alone, a service that competes with only a fraction of what the local paper provides.
- Prominent services of local newspapers are to allow: i) local businesses to advertise to local people; and ii) individuals to post classified advertisements. No BBC website offers such services. Arguably, however, a large number of non-BBC websites do offer people the opportunity to conduct these alternative functions online (e.g. eBay, Rightmove, Gumtree, eHarmony). Potentially, this multitude of websites allow local business and individuals to reach a larger, yet still targeted, audience than was possible with local newspapers and at lower cost. For that reason, a feasible hypothesis must be that the growth in general Internet usage (proxied, for example, by the growth in Internet penetration) has been responsible for a consumer shift away from local newspapers and towards other forms of information sharing, even at the local level.

In light of these observations about the evolution of the market, we have sought, in our analysis, to discriminate between two hypotheses:

1. that the decline of the local press is influenced by the availability of free content on the BBC website; and
2. that the decline of the local press is due to external factors such as the increase in competition for advertising revenues caused by the arrival and increase use of the Internet (and firms such as Google, eBay and Facebook), leaving a smaller number of potential readers and a smaller pot of advertising revenue available for the local press.

If the changes in local newspaper circulation can be satisfactorily explained by variables such as the degree of Internet penetration, the growth of household incomes, advertising revenues, consumer spending and time trends that antedate the creation of the BBC website, with no significant correlation with the number of BBC News website hits, then there is no evidence of crowding out based on the data available.

If, conversely, the number of BBC News website hits emerges from the regression with a significant negative coefficient, and the other variables do not, then crowding out could have occurred in this market.

3 / An economic review of the academic literature on crowding out

In order to inform our approach in evaluating the hypotheses set out in Section 2, we have analysed the economic literature to consider how crowding out by public service broadcasters across media markets has been addressed and tested by other experts and commentators (including academics and other consultancies). We also summarise how this literature has considered the potential positive role of PSBs in media markets and how this balances against empirical evidence, if any, of crowding out⁸.

We have found and reviewed 19 papers which consider the impact of PSBs on broadcasting markets. These papers were compiled through a thorough and comprehensive review of the literature including from academic journals.

The broad findings of the literature we surveyed are:

- there is evidence of only limited crowding out of private sector activity by PSBs both in the UK and globally; and
- PSB activity can, and does, have positive effects on the market such as enhancing quality through competition, providing for positive externalities and taking on high risk projects which commercial operators would not invest in but which bring market wide benefits;

We now consider these points in turn.

3.1 Commentators have found little tangible evidence of PSBs crowding out private sector activity

Our literature review was comprehensive, though we identified only six papers that attempted to *quantify* the extent of crowding out by PSBs in the UK and other markets.

The papers we reviewed on the subject found no, or limited, evidence of crowding out.

In general, two approaches were taken towards quantifying the extent of crowding out:

1. assumption based financial analysis looking at counterfactuals; and
2. econometric analysis.

The six papers which do attempt to quantify crowding out are outlined in Table 1.

8

In Appendix 1 we also summarise what drivers of broadcasting market activity, other than PSB activity, have been considered in these papers. We find that: i) when analysing the level of activity in broadcasting markets, it is common to look at audience numbers, revenues and programme formats; and ii) the main influences on the level of activity in broadcasting markets are found to levels of investment / funding, education and GDP.

Table 1: Summary of papers that attempt to quantify the extent of crowding out by PSBs

Paper	Approach	Conclusions
Berry & Waldfogel (1999) ⁹	<ul style="list-style-type: none"> • Cross-sectional econometric study of radio stations for 165 major radio markets in the US during Spring 1993 looking in particular at channels specialising in jazz music, classical music and news. • The study assessed how different factors influenced the number of commercial broadcasters in each market, including the presence of public sector broadcasters, economic variables, population density, levels of education and demographic factors. 	<ul style="list-style-type: none"> • No evidence of crowding out between PSBs and commercial broadcasters providing news. • Evidence of only limited potential crowding out by PSBs of commercial broadcasters specialising in classical music and jazz. Without a PSB, the authors found that over 85 per cent of markets would lose access to classical radio channels and over 80 per cent of markets would lose access to jazz radio channels.
Graf (2004) ¹⁰	<ul style="list-style-type: none"> • Graf highlights a KPMG report, commissioned in 2003, which outlines that the impact of BBC Online may have reduced total expenditure on UK advertising by around £5 million per annum, out of an estimated total of £200 million per annum. 	<ul style="list-style-type: none"> • Graf indicates that although the KPMG report does not conclusively show that BBC Online has only had a limited adverse impact on the market, the statistical information presented does not show competition has been eliminated across wide areas of content. • Graf suggests that BBC Online could theoretically reduce competition in the media market by deterring investment by commercial operators no robust evidence is provided of tangible examples where the BBC has reduced competition in a range of online content markets.
McKinsey (2004) ¹¹	<ul style="list-style-type: none"> • Cross-sectional statistical correlation analysis of 13 countries looking at content broadcast markets. • Study assessed how factors including PSB funding per head, GDP per head and language impacted on the level of commercial funding per head in terms of subscription funding and advertising funding. 	<ul style="list-style-type: none"> • McKinsey concluded that: "... <i>there is no evidence that commercial funding is commonly 'crowded out' by high levels of public funding</i>". • Level of public funding per head had no statistically significant effect on the level of advertising and subscription funding per head. • GDP had the most statistically significant effect on the level of advertising and subscription funding per head for commercial broadcasters.
Ofcom (2004) ¹²	<ul style="list-style-type: none"> • Sensitivity analysis, conducted with Spectrum Strategy Consultants, of Oliver & Ohlbaum Associates report assessing the market impact of BBC's new digital services. • Oliver & Ohlbaum Associates¹³, undertook an assumption-based, financial model to estimate that the total impact on commercial TV revenues was between -£3.3 million and -£31.1 million per annum, whilst that on radio was +£2.9 million per annum. 	<ul style="list-style-type: none"> • The analysis found that BBC activity could drive up the cost of original content and reduce the funds available for new programming by commercial operators. However, Oliver & Ohlbaum Associates' estimates are sensitive to changes in the underlying drivers. • The study also found that the BBC had brought benefits in contributing to the digital uptake amongst households which may even lead to increased commercial revenues in the future. • Overall, the analysis was scenario-based, sensitive to assumptions and inconclusive regarding the actual extent of historical crowding out.

9 Berry & Waldfogel, 1999, Public Radio in the United States: does it correct market failure or cannibalize commercial stations?, Journal of Public Economics, Issue 71, p. 189-211.

10 Graf, 2004, Report of the Independent Review of BBC Online.

11 McKinsey, 2004, Review of Public Service Broadcasting around the world.

12 Ofcom, 2004, Assessment of the Market Impact of the BBC's New Digital TV and Radio Services: An analysis by Ofcom, conducted as an input into the independent reviews of the BBC's new digital TV and radio services.

13 Oliver & Ohlbaum Associates, 2004, An Assessment of the Market Impact of the BBC's Digital TV Services A Report for the BBC's Submission to the DCMS Review; Oliver & Ohlbaum Associates, 2004, The Market Impact of the BBC's Digital Radio Services A Report for the BBC's Submission to the DCMS Review.

Paper	Approach	Conclusions
BBC (2013) ¹⁴	<ul style="list-style-type: none"> • Cross sectional econometric analysis of 14 countries looking at television markets. • Study assessed how commercial market outcomes (a composite of revenues per capita, investment per capita in original programmes and schedule diversity) were impacted by PSB health (a composite of public funding per capita, investment per capita in original programmes and schedule diversity) and GDP per capita. 	<ul style="list-style-type: none"> • Statistically significant <u>positive</u> correlation between commercial market outcomes and PSB strength. • GDP per capita coefficient was not statistically significant in explaining the level of commercial television operator performance.
Barwise & Picard (2014) ¹⁵	<ul style="list-style-type: none"> • Assumption-based financial model producing a counterfactual scenario of the impact of there being no BBC. • The authors produced 'optimistic' and 'pessimistic' scenarios based on assumptions around commercial operator's subscription income, advertising income and investment (determined as a proportion of revenues and flexed for optimistic and pessimistic scenarios). • 'Optimistic' scenario assumes all £2.72 billion of the 2012 Licence Fee income will transfer to commercial operators through, for example, higher subscription fee-based revenue and that advertising revenue will increase by 22 per cent. • 'Pessimistic' scenario assumes that commercial operators do not increase revenues through a transfer of Licence Fee income and that advertising revenues fall by 15 per cent. 	<ul style="list-style-type: none"> • The counterfactual analysis suggests that the extent of crowding out, insofar as it exists at all, is limited. • The paper finds in its counterfactual analysis that without the presence of the BBC: <ul style="list-style-type: none"> • industry revenues, although uncertain, might be lower; • content investment might be between 5 per cent to 25 per cent lower; and • first-run content investment might be between 25 per cent to 50 per cent lower. • Authors suggest that, on theoretical grounds, most economists are likely to conclude that the BBC has at least some crowding out effect overall across the markets in which it operates. However, this is not quantified and no actual proof of such outcomes are provided.

We found no papers that assessed the extent to which publicly provided online news sources had affected on local commercial print media with respect to crowding out.

However, a recent Enders Analysis paper (2015)¹⁶ did look at the BBC's effect on regional and national news providers. The paper finds that UK newspaper publishers have faced challenges from the move to the Internet, and the associated loss in print advertising revenues, and have struggled to monetise online audiences.

It concludes that the BBC has not exacerbated these challenges.

Rather, the Enders Analysis paper concludes that the BBC does not crowd out commercial providers since:

- BBC News is not a close substitute for the service offered by commercial news publishers as many consumers rate BBC News more highly for trustworthiness, impartiality and quality;
- some of the online traffic other publishers currently receive comes from the BBC News site; and
- some of the publishers best placed to take advantage of a BBC retreat from online News are UK newspapers, but others, including US brands, could also take advantage thus limiting the benefit for UK news publishers.

The paper also concludes that the effect of general Internet activity on the news business model is a far greater issue for local newspaper publishers than any impact from BBC activities.

¹⁴ BBC, 2013, Public and private broadcasters across the world – the race to the top.

¹⁵ Barwise & Picard, 2014, What if there were no BBC television? The Net Impact on UK Viewers, Reuters Institute for the Study of Journalism.

¹⁶ Enders Analysis, 2015, The BBC, the press and online news.

Oliver and Ohlbaum (2015)¹⁷, in a report for the News Media Association, offer similar limited evidence of the BBC crowding out private sector news providers but does suggest there is a potential *future* risk of this occurring if BBC investment increases further. The report highlights the BBC's intention, outlined in its 'Future of News' report¹⁸, to expand its local and international news offering. The paper outlines that the wider news sector is facing challenges but remains vibrant and further BBC expansion could put the sector at risk. We consider, however, that even though we cannot rule out this eventuality transpiring, it is uncertain given current available evidence.

Gentzkow (2006)¹⁹, in his analysis of the market for print on online newspapers in Washington, concludes that, under conditions of observed and unobserved heterogeneity, print news and online news act as substitutes. In a counterfactual analysis, he estimates that the online paper had reduced print readership by around 27,000 per day.

In summary, in our analysis of the available literature on the subject, there are only a small number of papers which conduct robust analysis quantifying the impact of crowding out by PSBs. Of those papers outlined above, whilst crowding out is pointed to as a theoretical possibility, the empirical evidence points to no or little crowding out by PSBs.

3.2 PSB activity can, and does, have positive effects

Whilst the literature, overall, finds evidence of only limited crowding out by PSBs, some papers do highlight the positive roles that PSBs can play in media markets.

In particular, several papers consider how public sector spending and investment, rather than crowding out investment by private operators, can benefit the market as a whole.

Our review includes eight papers that focus on this area.

O'Hagan and Jennings (2003) outline five potential benefits of PSBs:

1. Diversity: The evidence suggests that PSBs ensure a greater diversity of programmes which increases consumer welfare.
2. Democracy/equality: The evidence suggests that PSBs provide independent platforms to disseminate information, which is considered to be a necessary condition for democracy.
3. Network externalities: The paper asserts that PSBs ensure that programming that provides a shared experience and unites people under a common culture will reach a universal audience.
4. Innovation and investment: The paper finds that PSBs take risks that commercial broadcasters will not and consider the long term more than their commercial counterparts.
5. Public broadcasting as 'insurance': The evidence suggests that PSBs provide insurance: of standards; against a private operator monopolising broadcasting infrastructure; and against all private broadcasters shutting down and providing no service.

The wider literature provides further insight into these points.

Waldfoegel (2011)²⁰ considers content diversity, highlighting the greater marginal impact of public stations on news variety. In addition, Van Der Wurff (2005)²¹ suggests that the presence of a PSB guarantees greater programme diversity and supply of minority programmes, even if this is not proportional to the number of PSBs in a market. Foster, Egan & Simon (2002)²² considers the potential of private sector broadcasters not providing certain types of programmes (e.g. children's television and regional content) if they are not profitable. The paper finds that this diversity of content carries with it an opportunity cost that can be high for commercial providers.

17 Oliver and Ohlbaum Associates Ltd, 2015, The news market in the 21st Century and the likely implications for the BBC's role.

18 BBC, 2015, Future of news.

19 Gentzkow, 2006, Valuing new goods in a model with complementarities: online newspapers, NBER, Working Paper No. 12562.

20 Waldfoegel, 2011, Station Ownership and the Provision and Consumption of Radio News.

21 Van Der Wurff, 2005, Competition, Concentration and Diversity in European Television Markets, Journal of Cultural Economics, Issue 29, p. 249-275.

22 Foster, Egan & Simon, 2002, Measuring Public Service Broadcasting.

The literature considers that media generates positive externalities²³ in the form of shared cultural, social and political values (Picard & Siciliani, 2013; Barwise & Picard, 2012)²⁴. These positive externalities may be lost in the absence of a PSB if, for example, commercial providers reduced their content range. The evidence suggests that the presence of a PSB expands output and ensures that the wider social benefit of broadcasting is captured.

The literature finds that PSBs invest in areas where the private sector may not due to the high risk nature of PSBs' investment. However, once PSBs have made this investment: i) there are benefits to the wider industry; and ii) the private sector may learn from PSBs investment in these areas. As a result, public sector investment, in these instances, is complementary to private sector investment. In Picard & Siciliani (2013)²⁵, Mazzucato highlights examples where the BBC has invested in high risk projects that the paper considers may not have been picked up by the private sector, but which, subsequently, produced market wide benefits. These areas include: investing in innovative programs, technologies, processes, services, solutions; training and mentoring for small enterprises; and promoting foreign direct investment ('FDI'). For example, the paper highlights the development of Stagebox²⁶. BBC (2013)²⁷ finds that increased competition in media markets, which might lead to investment by the public sector, can help to generate greater innovation in the industry and, as a result, greater overall growth.

The virtuous cycle hypothesis²⁸ is the basis for much of the academic literature in the area which considers how competition between PSBs and the private sector affects programming quality. BBC (2013)²⁹ found a positive relationship between a PSB investing in high quality and diverse content and the strength (revenues) of the commercial market in the country, having analysed 14 countries. The paper finds that countries with a PSB with a high proportion of key public service genres tend to have main commercial channels that also produce a higher proportion of these programs. In all the markets considered in the study, PSB channels are judged by audiences to be of a higher quality than commercial channels. In its counterfactual analysis, Barwise & Picard (2014)³⁰ highlight that if there was no BBC, there might be a significant fall in content investment, with lower value for money to customers. Ofcom (2004)³¹ outlines that, following the move to digital TV and radio services, the role for the BBC in providing competition would likely fall as competition grew and channels became better funded. However, even under these conditions, the paper highlights that the BBC would still have a role in setting standards and encouraging different forms of competition.

Overall, the evidence outlined above points to a wide range of potential benefits to the presence of a PSB in the broadcasting market. Although these are not quantified, they should be taken into consideration when assessing the market impact of a PSB.

23 An externality is a market failure whereby the social benefit/ cost of a good is greater than the private benefit/ cost. As a result the free market will under/ over provide the good.

24 Picard & Siciliani, 2013, Is there Still a Place for Public Service Television? Effects of the Changing Economics of Broadcasting, Reuters Institute for the Study of Journalism; Barwise & Picard, 2012, The Economics of Television in a Digital World: What Economics Tells Us for Future Policy Debates, Reuters Institute for the Study of Journalism.

25 Picard & Siciliani, 2013, Is there Still a Place for Public Service Television? Effects of the Changing Economics of Broadcasting, Reuters Institute for the Study of Journalism.

26 Allows HD multi-camera productions to use standard internet technologies to link equipment.

27 BBC, 2013, Public and private broadcasters across the world – the race to the top.

28 Competition between public and private providers produces better programs for audiences.

29 BBC, 2013, Public and private broadcasters across the world – the race to the top.

30 Barwise & Picard, 2014, What if there were no BBC television? The Net Impact on UK Viewers, Reuters Institute for the Study of Journalism.

31 Ofcom, 2004, Assessment of the Market Impact of the BBC's New Digital TV and Radio Services: An analysis by Ofcom, conducted as an input into the independent reviews of the BBC's new digital TV and radio services.

4 The evidence on whether the BBC crowds out private sector broadcasting

4.1 BBC activity in the entertainment and news broadcasting

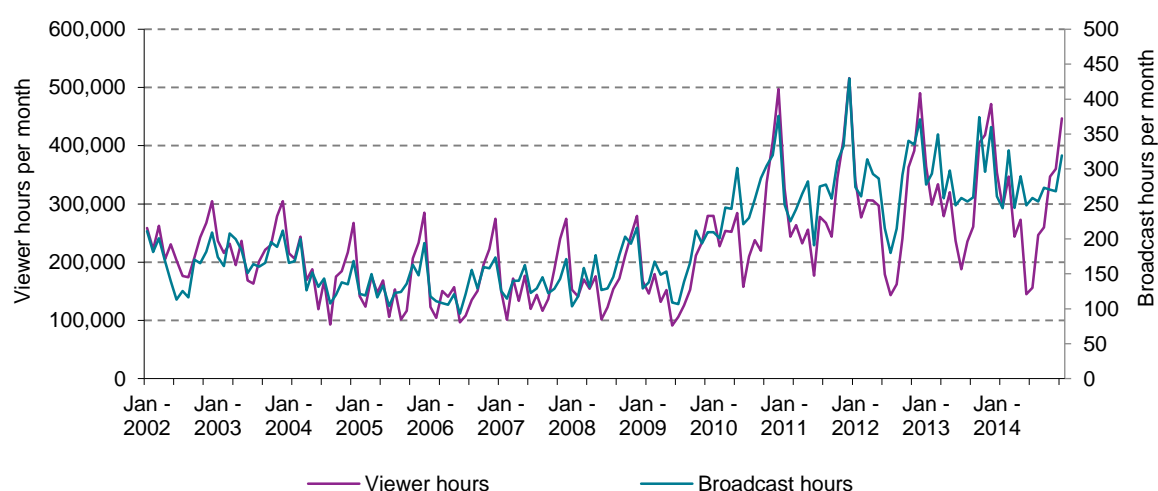
4.1.1 There has been an increase in BBC broadcast and viewer hours in the entertainment genre and an increase in news broadcasting hours since 2002

As part of its stated public purposes and remit, the BBC has obligations to provide journalism of the highest quality and to provide a wide range of enjoyable and entertaining content³². It is, however, to a large degree, up to the BBC to decide how *much* of this content it provides, although the BBC Trust sets a range of minimum quotas on certain genres of broadcast output³³.

Figure 1 below shows total broadcast and viewer hours in the entertainment genre for BBC channels between 2002 and 2014.

BBC broadcast and viewer hours in the entertainment genre declined by an average of 0.8 per cent and 4.6 per cent respectively between 2002 and 2009. There has been a sharp increase in broadcast and viewer hours since 2009 however; in 2014, broadcast hours in entertainment were 74 per cent higher than in 2009 and viewer hours 76 per cent higher.

Figure 1: Total entertainment broadcast and viewer hours for BBC channels, 2002 – 2014³⁴³⁵



Source: BARB data supplied by the BBC Trust.

Figure 2 shows the total broadcast and viewer hours per month in news for BBC channels between 2002 and 2014. Between 2002 and 2012, news broadcast and viewer hours remained relatively constant, growing at an average of 0.2 per cent and 0.4 per cent per annum respectively. Since 2012, broadcasting hours increased more rapidly at an average rate of 3.2 per cent per annum.

³² Table 1, BBC Charter Review, Public Consultation (16 July – 8 October 2015), Department for Culture, Media and Sport.

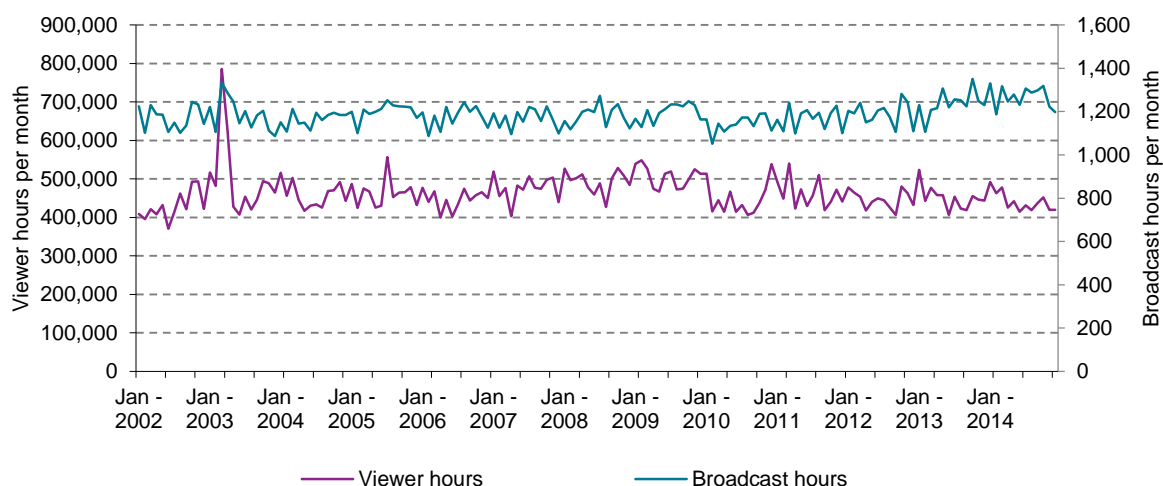
³³ See, for example, http://downloads.bbc.co.uk/bbctrust/assets/files/pdf/regulatory_framework/service_licences/tv/2013/bbc_one.pdf

³⁴ Due to a change in the BARB dataset in 2010, the data changed considerably post 2010. To correct for this, we have set broadcast and viewer hours in December 2009 equal to January 2010 and used the monthly growth rates to calculate the pre-2010 numbers. The trend in, and not level of, activity is what we are most interested in. This has been done for all graphs with viewer and broadcast hours.

³⁵ There was an unexplained spike in entertainment broadcast hours in June, July and August 2014. For the purpose of the Figure 1, we set the broadcast hours equal to the equivalent month in 2013.

This increase in news broadcast hours has not been reflected in viewer hours which have declined by an average of 0.6 per cent per annum since 2012.

Figure 2: Total news broadcast and viewer hours per month for BBC channels, 2002 – 2014



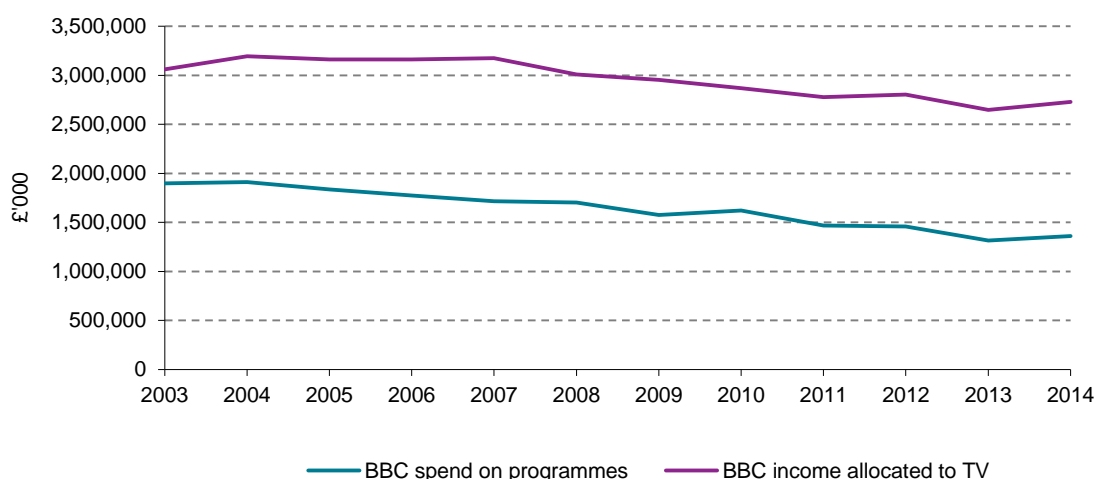
Source: BARB data supplied by the BBC Trust.

4.1.2 BBC income and programme spend declined, in real terms, since 2004

Although the number of hours of news and entertainment broadcast by the BBC has increased over the period, overall spending on programmes has been in decline.

As can be seen in Figure 3, the BBC increased its spending on programmes by 0.7 per cent between 2003 and 2004, however spending has since declined. BBC spending on programmes fell by an average of 3.3 per cent per annum, in real terms, between 2004 and 2014.

Figure 3: BBC income allocated to TV and spend on programmes, 2003 – 2014 (£'000, 2014 prices)³⁶



Source: Ofcom communications market reports.

A similar decline in the BBC's income allocated to television (which declined by an average of 1.6 per cent per annum, in real terms, between 2004 and 2014), shown in Figure 3, may go some way to explaining the fall in the BBC's spending on programmes since 2004.

4.2 Commercial news and entertainment broadcasting activity has also increased considerably since 2002

4.2.1 With the exception of news viewer hours, commercial broadcast and viewer hours follows a similar pattern to the BBCs between 2002 and 2014

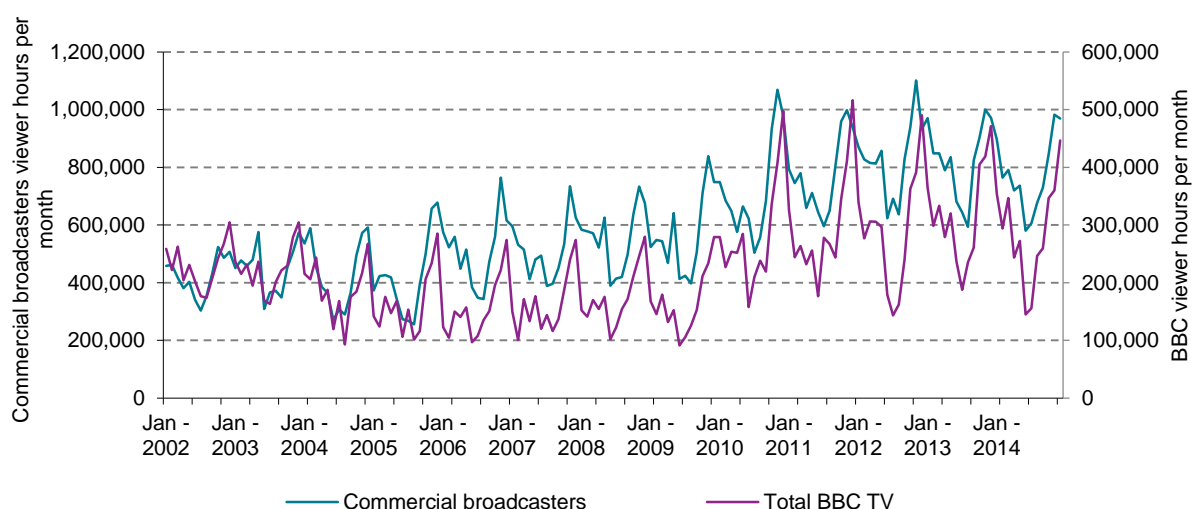
4.2.1.1 Entertainment broadcasting

Entertainment viewer hours have increased for both the BBC and commercial broadcasters between 2002 and 2014.

However, the growth for commercial broadcasters has been more rapid, increasing at an average of 5.2 per cent per annum between 2002 and 2014, compared to the BBC's average growth of 1.9 per cent per annum.

By 2014, commercial broadcasters' viewer hours were 168 per cent larger than the BBC's; in 2002 they were 84 per cent larger.

Figure 4: BBC and commercial broadcasters' entertainment viewer hours per month, 2002 – 2014³⁷



Source: BARB data supplied by the BBC Trust.

Although entertainment broadcast hours have followed relatively similar trends for the BBC and commercial broadcasters since 2009, this was not the case between 2002 and 2009. Commercial broadcasters' entertainment broadcast hours increased by an average of 6.8 per cent per annum, whereas BBC entertainment broadcast hours fell by 0.8 per cent per year on average between 2002 and 2009. Since 2009, the growth in commercial entertainment broadcast hours fell to an average of 3.0 per cent per annum whereas BBC entertainment broadcast hours increased by an average of 11.7 per cent per year between 2009 and 2014.

Although over the whole period, both BBC and commercial broadcasters' entertainment broadcast hours have increased, commercial broadcasters' hours have done so at a faster rate than the BBC's. In 2002, commercial broadcasters aired approximately 12 times more entertainment content than the

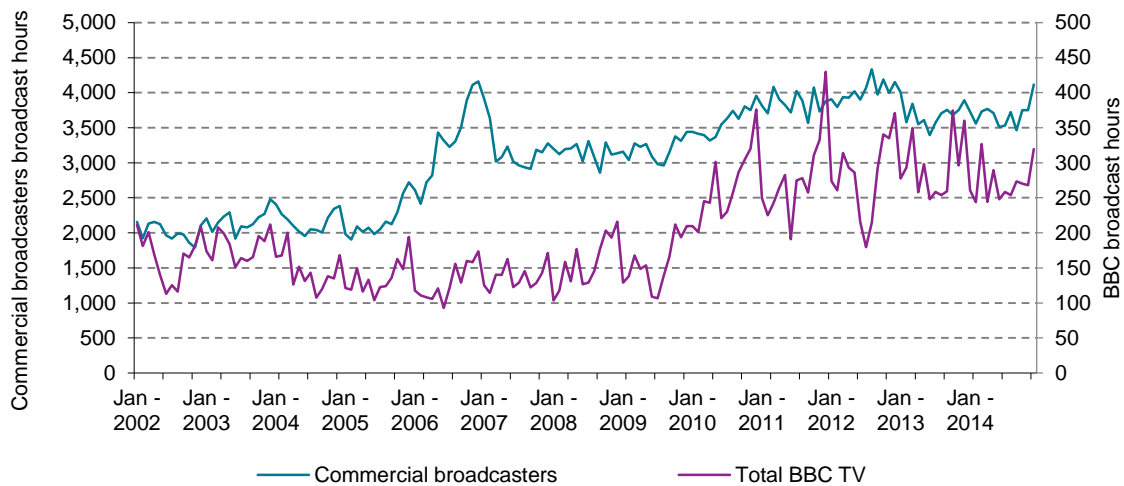
37

Commercial entertainment viewer and broadcast hours are equal to the sum of the ITV, Channel 4, Channel 5, UKTV and Sky (including Flextech) portfolios as reported by BARB. Prior to 2010, BBC and commercial digital channel data were collected separately (on the multi-channel reporting platform) and added to the terrestrial totals.

BBC; this increased to approximately 20 times as much entertainment content in 2009 before falling back to approximately 14 times as much entertainment content by 2014.

Viewer hours followed a similar trend over this period, peaking in 2009 when commercial broadcasters' entertainment viewer hours were approximately 3.5 times larger than the BBC's. This factor was 1.8 times in 2002 and 2.7 times in 2014.

Figure 5: BBC and commercial broadcasters' entertainment broadcast hours per month, 2002 – 2014



Source: BARB data supplied by the BBC Trust.

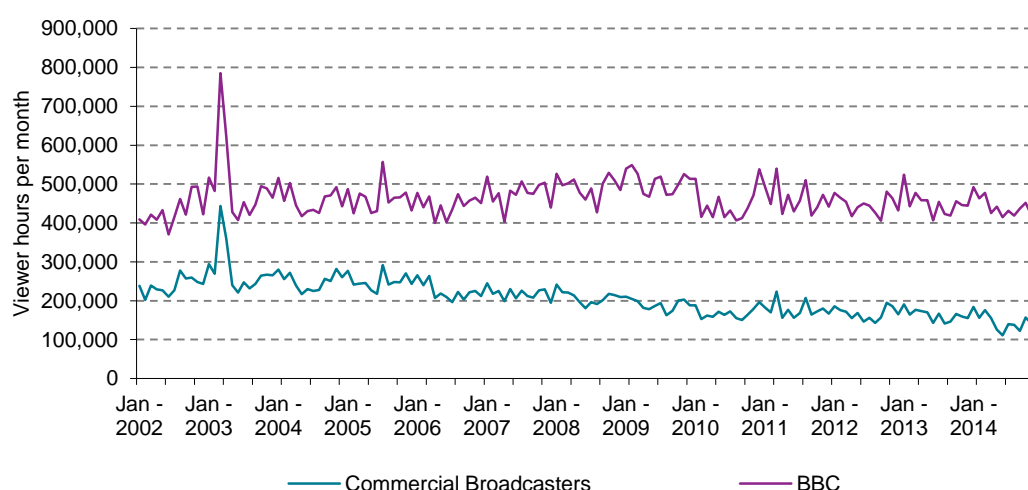
Between 2002 and 2014, there was a relatively strong *positive* 64 per cent correlation between the BBC's and commercial broadcasters' entertainment broadcast hours. There was an even stronger 81 per cent *positive* correlation for entertainment viewer hours. Based on the available data, there does not, therefore, appear to be any crowding out of commercial broadcasters by the BBC in entertainment, when measured by broadcast and viewer hours. In fact, entertainment broadcast and viewer hours for commercial broadcasters have increased at a faster rate than for the BBC during the period analysed.

4.2.1.2 News broadcasting

Other than the spike in March 2003, which coincides with the start of the Iraq war, Figure 6 shows that the BBC's news viewer hours have remained relatively constant, increasing by a total of just 2.9 per cent, between 2002 and 2014.

However, there has been a steady decline in viewer hours for commercial news broadcasters. From its peak in 2003, Figure 6 shows that commercial broadcasters' news viewer hours have declined by an average of 5.9 per cent per annum to 2014.

Figure 6: BBC and commercial broadcasters' news viewer hours per month, 2002 – 2014³⁸³⁹

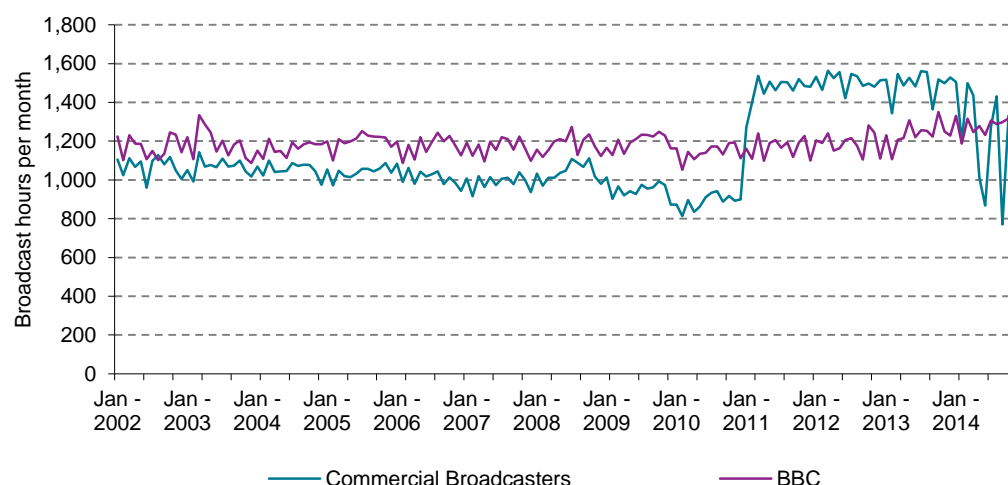


Source: BARB data supplied by the BBC Trust.

Given that, up until 2014, there has not been any significant increase in BBC viewer hours, and the BBC's news broadcast hours have not increased more rapidly than commercial broadcasters' broadcast hours, it is by no means clear that this pattern in commercial broadcasters' news viewer hours is driven by an increase in the BBC's activity in the provision of news relative to that of commercial broadcasters.

Figure 7 shows the BBC's and commercial broadcasters' news broadcast hours per month between 2002 and 2014.

Figure 7: BBC and commercial broadcasters' news broadcast hours per month, 2002 – 2014⁴⁰



Source: BARB data supplied by the BBC Trust.

38 Commercial news viewer and broadcast hours are equal to the sum of ITV/Breakfast (including HD & +1), CH4 (Stagger), Channel 5 Portfolio, and Sky (including Flextech) Portfolios as reported by BARB.

39 Prior to 2010, BBC News data were collected separately (on the multi-channel reporting platform) and added to the BBC terrestrial news total hours.

40 There is significant variation in commercial broadcasters' broadcast hours in 2014. December 2014 was significantly below all previous months. For the purpose of Figure 7, we have presented broadcast hours for news up until November 2014.

After remaining relatively flat between 2002 and 2008, then declining up until 2010, news broadcast hours for the BBC and commercial broadcasters have been on an upward trend between 2010 and 2013, with commercial broadcasters' news broadcast hours falling in 2014.

Between 2010 and 2012, commercial news broadcast hours increased by an average of 30.4 per cent per annum on average compared to an average annual increase of 2.1 per cent per year for the BBC. This trend resulted in commercial channels broadcasting 26.9 per cent more news than the BBC in 2012. However, a decline in commercial broadcasters' news provision between 2012 and 2013 meant that commercial channels broadcast 20.8 per cent more news than the BBC in 2013. Whereas the BBC's news broadcast hours continued to increase by 2.5 per cent between 2013 and 2014, commercial broadcasters news broadcast hours declined by 23.8 per cent.

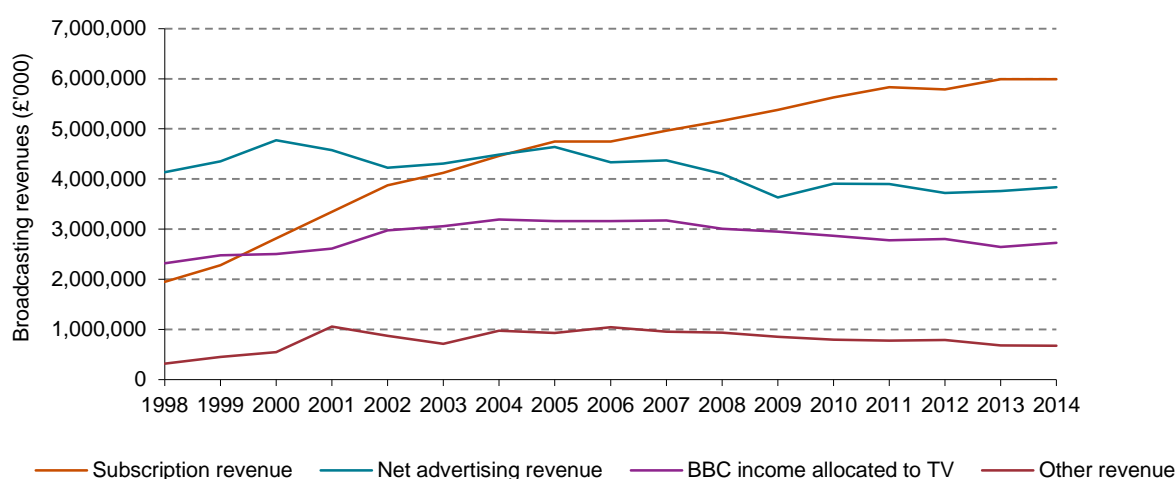
Despite the increase in BBC broadcast hours, the charts above demonstrate that BBC viewer hours have remained relatively constant whereas commercial broadcasters' viewer hours have declined; the fact that the relative amount of news provided by the BBC compared to commercial channels has not widened implies that although there has been much change in the provision of news, and in the behaviour of people who watch news, there is no clear evidence that viewers have switched from watching commercial broadcast news to BBC news or any behaviours that are consistent with the notion of the BBC 'crowding out' commercial news broadcasters' viewers.

In summary, between 2002 and 2014, there was a positive 30 per cent correlation between the BBC's and commercial broadcasters' news broadcast hours and a stronger 54 per cent correlation for viewer hours. Based on the available data, therefore, there does not appear to be any crowding out of commercial broadcasters by the BBC in terms of news broadcast and viewer hours.

4.3 A significant increase in subscription revenues has led to an increase in commercial broadcasters' revenues since 1998

Figure 8 shows television broadcasting revenues for the BBC and commercial providers, in real terms, between 1998 and 2014.

Figure 8: Broadcasting revenues by source, 1998 – 2014 (£'000, 2014 prices)⁴¹



Source: Ofcom communications market reports, KPMG analysis

41 Other commercial broadcasting revenue include, inter alia, Sponsorship, Programme sales, interactive, TV shopping, pay-per-view and S4C income.

The BBC's income allocated to television has remained relatively constant, in real terms, since 1998. After increasing by an average of 5.5 per cent per annum, in real terms, between 1998 and 2004, it then declined by an average of 1.6 per cent per annum between 2004 and 2014.

Over the same period, commercial broadcasting revenues have increased. They grew by an average of 5.4 per cent per annum, in real terms, between 1998 and 2007. This growth continued, albeit at a slower pace of 0.3 per cent per annum, in real terms, between 2007 and 2014, after the global economic and financial crises took hold. Nevertheless, commercial broadcasters' revenues are now almost 65 per cent higher in real terms than they were in 1998.

This growth in commercial broadcasting revenues can be attributed primarily to the growth in subscription revenues. The average annual decline in advertising revenues of 0.5 per cent has been more than offset by the 7.3 per cent annual increase in subscription revenues since 1998.

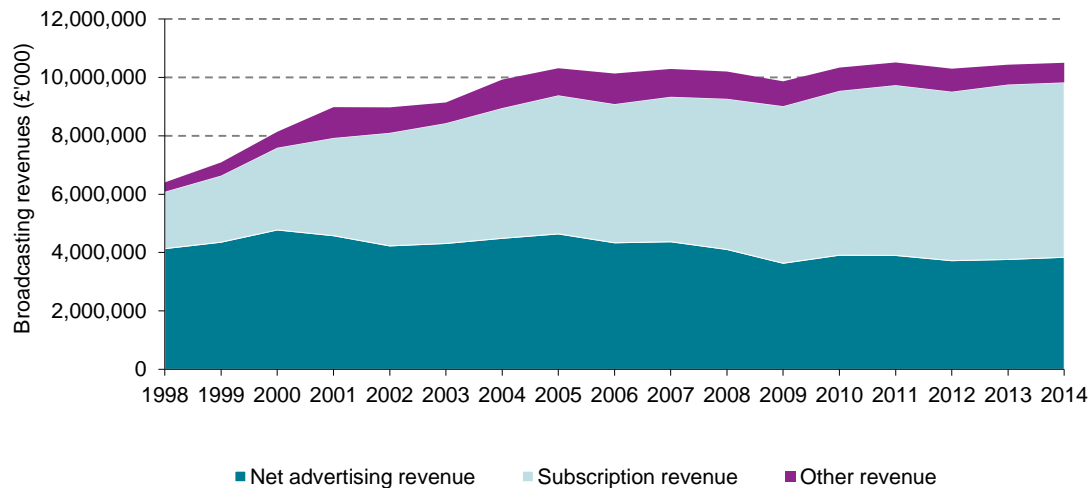
As a result, subscription revenues now account for 57.0 per cent of total commercial broadcasting revenues, compared to just 30.4 per cent in 1998.

By 2014, BBC revenues, shown in Figure 8 above, allocated to television were:

- 40.7 per cent lower than commercial advertising revenues;
- 119.6 per cent lower than commercial subscription revenues; and
- 285.0 per cent lower than total commercial broadcasting revenues.

By contrast, BBC revenues allocated to television were 176.3 per cent lower than total commercial broadcasting revenues in 1998.

Figure 9: Composition of commercial broadcasting revenues, 1998 – 2014 (£'000, 2014 prices)



Source: Ofcom communications market reports.

Based on the available data, there does not appear to be any evidence that any change in BBC activity, or the presence of the BBC, has prevented a real terms increase in commercial broadcasters' revenues. BBC revenues allocated to television have not grown, and commercial broadcasters' revenues have grown rapidly, albeit with a different composition with an increased proportion coming from subscription revenues.

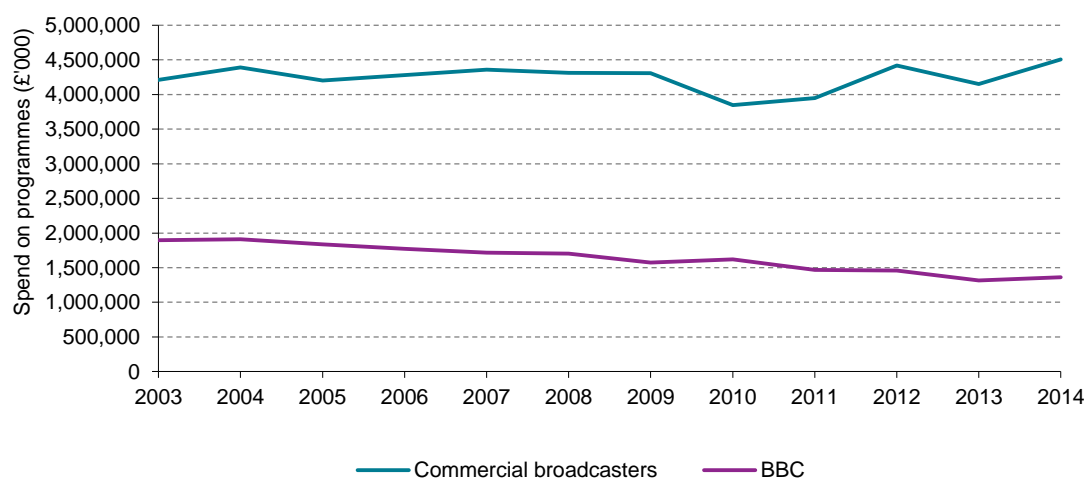
Since revenues and profits drive commercial broadcasters' capacity to spend money on content, this might also suggest little evidence of BBC activity crowding out commercial broadcasters' expenditure.

4.4 There is little evidence that BBC spending has crowded out commercial broadcasters' spending since 2003

4.4.1 Spending on programmes has declined for the BBC and increased for commercial broadcasters since 2003

Figure 10 below shows the trend of BBC and commercial broadcasters' expenditure on programmes, in real terms, between 2003 and 2014. The BBC's spending on programmes has declined by an average of 3.0 per cent per annum, in real terms, between 2003 and 2014. Income has also declined by an average of 1.0 per cent per annum over the same period. Spending on programmes by commercial broadcasters has increased by an average of 1.3 per cent per annum, in real terms, between 2003 and 2014, although this has varied over the period.

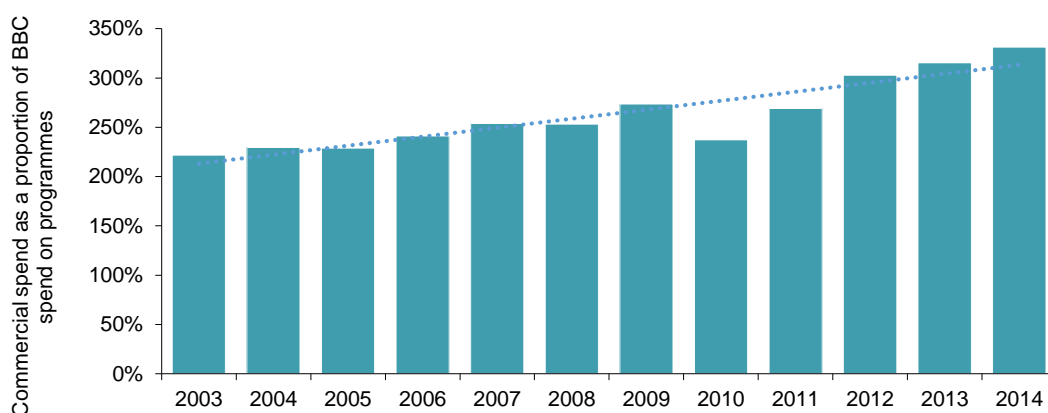
Figure 10: Broadcasters spending on programmes, 2003 – 2014 (£'000, 2014 prices)



Source: Ofcom communications market reports, KPMG analysis.

Figure 11 shows commercial broadcasters' spending on programmes as a proportion of BBC spend on programmes between 2003 and 2014.

Figure 11: Commercial broadcasters spend on programmes as a proportion of BBC spend on programmes, 2003 – 2014

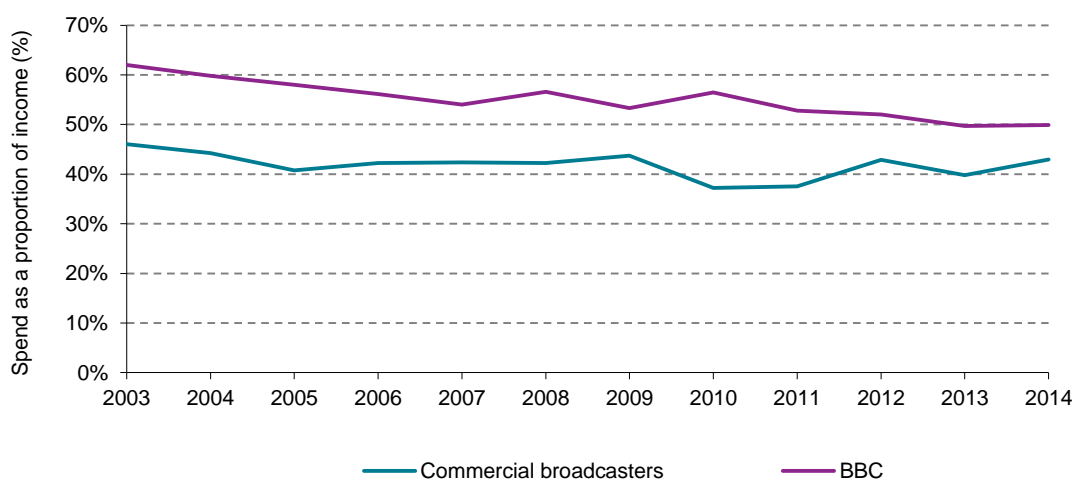


Source: Ofcom communications market reports, KPMG analysis.

Commercial broadcasters spend more on programmes than the BBC in real terms and this gap has widened since 2003. Based on this trend, there does not appear to be any crowding out of commercial broadcasters by the BBC in terms of overall spend on programmes over the last decade.

Figure 12 shows BBC and commercial broadcasters' spend on programmes as a proportion of their respective broadcasting revenue between 2003 and 2014. The BBC spends more on programmes as a proportion of income than commercial broadcasters. In 2003, the BBC spent approximately 62 per cent of its income allocated to television on programmes; commercial broadcasters spent approximately 46 per cent. Spending as a proportion of income for the BBC and commercial broadcasters has followed a similar trend over the past decade, with the BBC now spending approximately 50 per cent of its revenues on programmes and commercial providers approximately 43 per cent.

Figure 12: BBC and commercial broadcasters' spend on programmes as a proportion of broadcasting revenue, 2003 – 2014

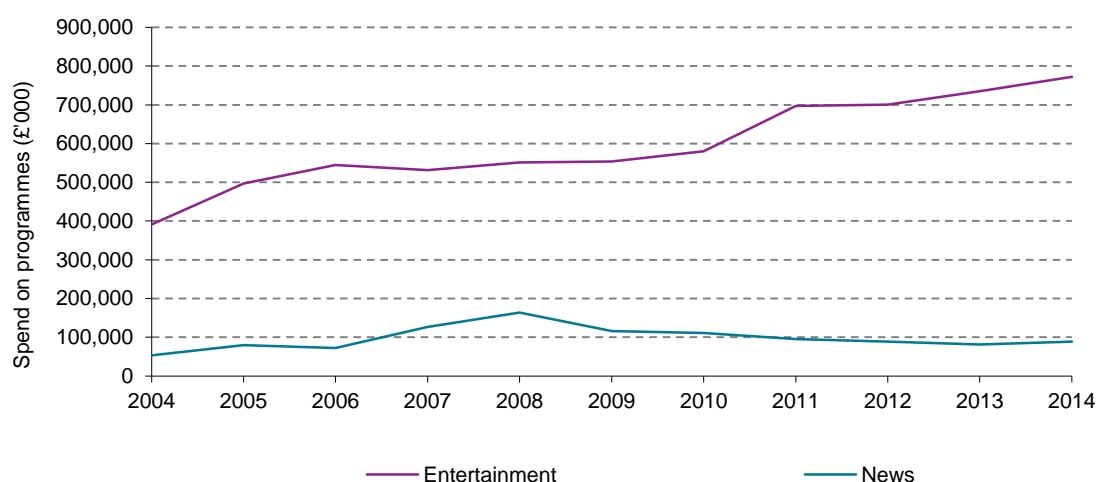


Source: Ofcom communications market reports, KPMG analysis.

As shown in Figure 13 below, there is also no evidence, based on the data analysed, that multichannel⁴² broadcasters' spend on entertainment or news has declined, in real terms, between 2004 and 2014. In fact, multichannel broadcasters' spend on entertainment programmes has increased by an average of 7.0 per cent per annum, in real terms, over the period.

42 'Multichannel' consists of: Sky, Viacom, UKTV, BT, Discovery, AETN, Turner, Disney, CSC and Baby TV in line with Ofcom definitions http://stakeholders.ofcom.org.uk/binaries/broadcast/reviews-investigations/psb-review/psb3/Annex_1_PSB_spend_and_output_2014.pdf

Figure 13: Multichannel broadcasters' programme spend by genre, 2004 – 2014 (£'000, 2014 prices)



Source: Ofcom communications market reports.

Overall, the trends in the above data demonstrate little evidence to support the notion that an increase in BBC spending has coincided with, and caused, a reduction in commercial broadcasters' activity, or, conversely, that a reduction in BBC activity has arrested a decline in commercial broadcasters' activity or allowed more rapid expansion. In fact, commercial broadcasters' spending on programmes has declined at a slower rate than that of the BBC over the past decade.

4.5 Based on the available data, our econometric analysis finds that there is no evidence that the BBC crowds out private sector broadcasting activity in news and entertainment

The charts shown above are consistent with the notion that the BBC does not crowd out commercial broadcasters' activity.

However, commercial broadcasters' performance is affected by a multitude of factors simultaneously.

Econometric regression analysis is a technique commonly used by economists to diagnose the relationship between a variable we are interested in analysing (technically known as the 'dependent variable') and a multitude of factors that affect it all at the same time (known as 'explanatory variables'). This widely-used statistical technique allows us to isolate, to a level of statistical confidence, the underlying correlation between numerous variables and the dependent variable. This technique is a powerful approach when it is combined with a hypothesis that is grounded in a strong economic framework.

We conducted a detailed econometric regression analysis to diagnose how changes in both commercial broadcasters' viewer hours and revenues respond to changes in a wide range of observable and collectable potential drivers of these variables. The level of BBC activity is one of them.

The detailed results of this analysis are shown in the Appendix 1 (pages 44 and 53 for entertainment and news respectively). A summary of the findings from our regression analysis is set out in the rest of this section.

4.5.1 Entertainment viewer hours econometric results

When conducting our regressions, we considered numerous different approaches, explanatory variables and functional forms.

In this case, our baseline regression model included the following explanatory variables:

- quarterly dummy variables⁴³ to account for any seasonal variation;
- a time trend to account for any general trend between years, for instance the effects of technological factors such as increasing internet and digital penetration;
- a variable for 2010 onwards to account for a step change in commercial news viewing caused by a change in the measurement technique of the data used; and
- GDP per capita to account for any wider macroeconomic trends.

The baseline model was statistically well-specified and explained c.93 per cent of the variation in the data. It also was statistically better specified than other approaches (using different explanatory variables and different functional forms) that we considered.

Figure 4 (page 20) shows that there is evidence of seasonality for commercial and BBC entertainment viewer hours. Our regression analysis finds that controlling for seasonality and a general time trend explains c.93 per cent of the changes in viewer hours for commercial broadcast entertainment. This means that other factors, even if statistically significant, explain only a relatively small proportion of the overall variation.

In order to test for crowding out, we ran two additional regressions using the baseline and including variables for BBC activity. These variables were:

- the total number of minutes of entertainment television broadcast by the BBC (which captures the total supply of news television to the public by the BBC); and
- BBC spending per minute of BBC entertainment television programme broadcasting (which potentially captures the quality of BBC's output, which might attract a larger audience all other things being equal)⁴⁴.

We found that when the BBC's minutes broadcast and spending per broadcast minute were included together in the regressions, neither had a statistically significant impact on commercial broadcast entertainment television viewer hours. This result is consistent with there being no crowding out of the BBC on commercial broadcasters' entertainment broadcasting.

When we included only the BBC's entertainment minutes broadcast, and exclude spending on entertainment per broadcast minute in our baseline regression, we find a similar result.

When, however we included only spending on entertainment per broadcast minute in our baseline regression, and excluded the BBC's entertainment minutes broadcast, we find the BBC variable appears to have a weak statistically significant negative impact on commercial broadcast minutes of entertainment (at a 10 per cent significance level). We do not consider that this is sufficiently strong evidence of crowding out because:

- the coefficient on the BBC's entertainment broadcasting spend has only a weak statistical significance in explaining changes in commercial broadcasters' entertainment viewer hours;
- the finding is not robust to changes in the regression specification – normally, for us to be confident of such a finding, we would expect to see it hold when the regression functional form is changed and / or when different explanatory variables are added (neither of which hold in this case).

It is, therefore, difficult to conclude that there is any statistically significant relationship between BBC activity in entertainment broadcasting and commercial broadcasters' entertainment viewer hours.

43 A 'dummy variable' allows the regression analysis (which can only use numerical data) to account for non-numerical factors, by converting them into numerical form.

44 The available data on BBC expenditure on content does not differentiate between broadcast categories, so we have used total BBC spending as a proxy for entertainment television spending. This requires the implicit assumption that a 10 per cent increase in the total spend by the BBC leads to a 10 per cent increase in the spending on BBC entertainment television.

4.5.2 News viewer hours econometric results

We adopted a similar approach to the econometric analysis of broadcast news television viewer minutes.

Our preferred baseline regression model included the following explanatory variables to explain the variation in commercial broadcast news viewer minutes:

- quarterly variables⁴⁵ to account for any seasonal variation;
- a time trend to account for any general trend between years, for instance the effects of technological factors such as increasing internet and digital penetration;
- a variable from 2010 onwards to account for a step change in commercial news viewing caused by a change in the measurement technique of the data used;
- an event variable for two quarters of 2003 when commercial viewing minutes of television news increased substantially as a result of the start of the Iraq war; and
- GDP per capita to account for any wider macroeconomic trends.

The baseline model was statistically well-specified and explains c.89 per cent of the variation in the data.

Other regression models we considered which included other variables, lagged dependent variables, and different functional forms, were not statistically as well-specified as our baseline model.

Figure 6 (page 22) shows that there is evidence of seasonality in viewer hours for commercial and BBC broadcast news. Our regression analysis finds that controlling for seasonality and a general time trend explains c.87 per cent of the changes in viewer hours for commercial broadcast news. This means that other factors, even if statistically significant, will explain help explain only a relatively small proportion of the overall variation.

In order to test for crowding out, we ran two additional regressions using the baseline and including the following variables for BBC activity:

- the total number of minutes of news broadcast by the BBC (which captures the total supply of news television to the public by the BBC); and
- BBC spending per minute of BBC news programme broadcasting (which potentially captures the quality of BBC's output, which might attract a larger audience all other things being equal).

We found no statistically significant impact of BBC's activity, both in terms of minutes broadcast and spending per broadcast minute, on commercial broadcast news viewer hours from the data analysed.

That is, the econometric analysis provides no statistical indication that the BBC crowds out commercial broadcast news measured by viewer hours.

Furthermore, in any other specifications of the regressions we analysed, we found no evidence consistent with the notion of crowding out. Our results were not dependent on the functional form or regression approach we adopted.

4.5.3 Commercial broadcaster revenues econometric results

We considered several different approaches to regressions to analyse commercial broadcasters' revenues.

45

A 'dummy variable' allows the regression analysis (which can only use numerical data) to account for non-numerical factors, by converting them into numerical form.

All of the regression models that we specified using total commercial broadcaster revenues on broadcasting as the dependent variable yielded results that were not statistically robust. This was due to a lack of available data and the associated limitations regarding the amount of data that we were able to analyse.

While we are unable to say from the statistical analysis, with any confidence, what the underlying drivers of commercial broadcaster revenues are, what we can say is that there is no evidence, based on the data that we were able to analyse, that a change in the BBC's activity has any statistically significant effect on them. That is, our analysis of the data available to us was consistent with the hypothesis that the BBC does not crowd out commercial broadcasters' revenues.

This is consistent with the charts above that show a steady and consistent increase in commercial broadcasters' revenues regardless of changes to the BBC's activity or revenues.

5 The evidence on whether the BBC crowds out local newspapers' activity

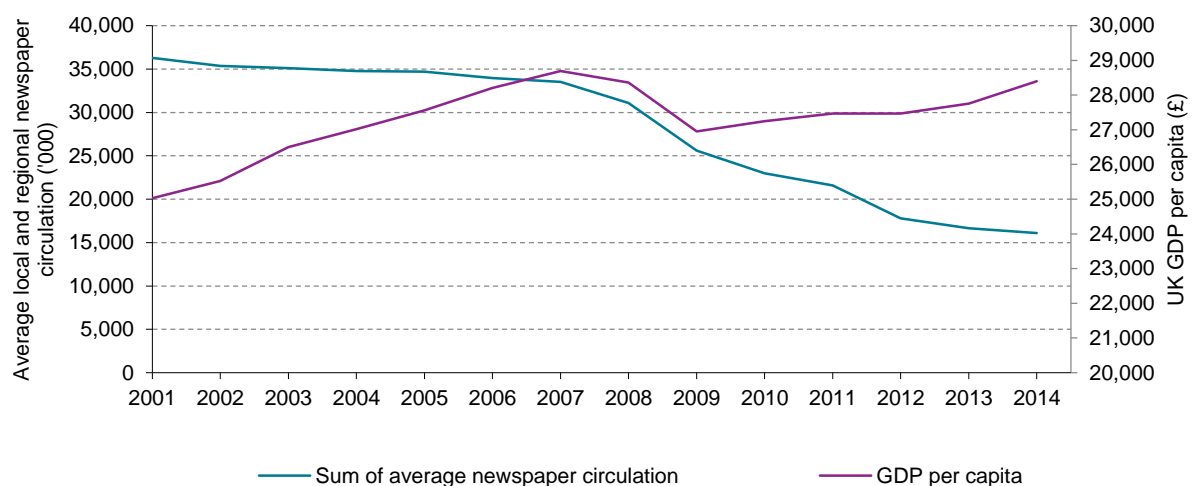
5.1 An acceleration in the decline of local newspaper circulation coincided with the start of the global economic crisis

Local and regional newspaper circulation has been in decline for many years.

Between 2001 and 2007, their circulation declined at an average rate of 1.3 per cent per annum.

Figure 14 shows that this decline accelerated after the economic downturn took hold, when circulation fell by an average of 10.0 per cent per annum between 2007 and 2014.

Figure 14: Average local and regional newspaper circulation and UK GDP per capita, 2001 – 2014 (£'000, 2014 prices)



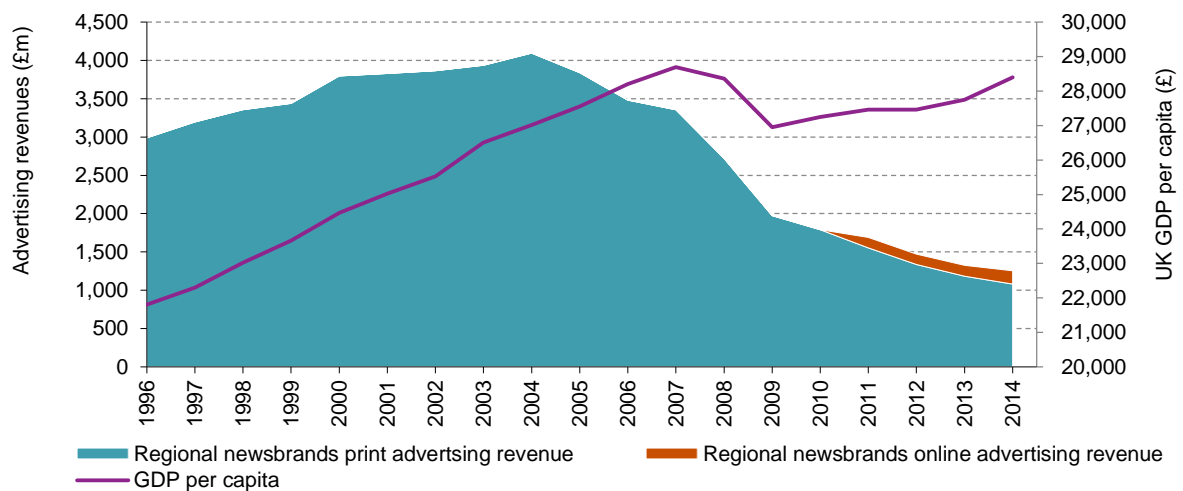
Source: JICREG, Office for National Statistics.

Like many businesses, the evidence suggests that local newspapers suffered as a result of businesses spending less on discretionary purchases – such as advertising in the local press, which, as can be seen in Figure 15, appears to move in line with GDP per capita – and consumers tightened their belts, cutting back on non-necessities (of which newspapers may have been one such item).

After peaking in 2004, regional and local newspaper print advertising revenues have declined by an average of 12.5 per cent per year, in real terms, to 2014.

Although regional and local digital advertising revenues have increased by an average of 8.3 per cent annually between 2011 and 2014, the level is still small and its growth has not, by a substantial margin, mitigated the decline in print advertising revenues. Even after the significant decline in print advertising revenues, digital advertising revenues still formed less than a fifth of total regional and local newspaper advertising revenues in 2014.

Figure 15: Regional newspaper advertising revenues (£m, 2014 prices) and UK GDP per capita (£, 2014 prices), 1996 – 2014



Source: WARC, Office for National Statistics.

Despite what appears to be an acceleration in the decline of revenues after the economic downturn, local newspapers, and their advertising revenues, were falling even when the economy was growing and continued to decrease after the economy began to pick up.

There is clearly more to the story than economic growth alone.

Picking up from the discussion in Section 2 above, there are a number of possible explanations.

One obvious potential explanation is the growth of the Internet, as people increasingly get their local news in different ways.

Another is the growth of the BBC News online, as measured by the number of clicks on the website.

On the face of it, the data are consistent with both explanations.

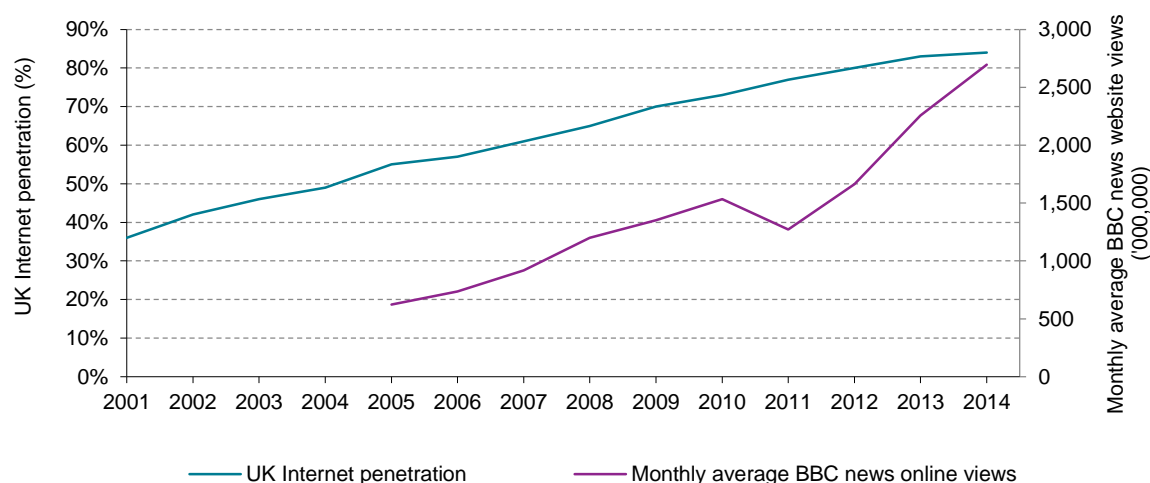
As Figure 16 shows, the number of BBC News website page views (i.e. all news, not only local news)⁴⁶ has increased rapidly at the same time as Internet penetration has been increasing. There is a positive 91 per cent correlation between the two data series.

So, how much of the decline in regional and local newspaper circulation is attributable to the general adoption of the Internet, and how much of the decline is due to the growth of the BBC News alone (in terms on the number of clicks on the BBC News website)?

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The BBC collects website hits overall and does not split these data between local news website hits and other BBC News website hits. We have, therefore, used BBC website hits in total to proxy web hits for BBC News.

Figure 16: UK Internet penetration and the BBC News website page views, 2001 – 2014



Source: Office for National Statistics, BBC data.

To address this question, it is helpful to consider the overlap between the provision of services from regional and local newspapers and the BBC and statistical analysis.

Regarding the former, as the discussion in Section 2 above explains, the BBC's online services provide only a subset of the content and services provided by regional and local newspapers. On that basis, the evidence is consistent with the notion that the BBC's online services can provide only partial competition to regional and local newspapers, at most. And, in turn, this implies that it seems unlikely that the BBC's online content alone – when accounting for the huge amount of information the average UK citizen gets from the Internet in the modern day and age – is unlikely to be the main reason for the decline in local newspapers. It is more likely, given the discussion in Section 2 above and the data, that Internet penetration had a more prominent role in the change in local newspaper circulation and advertising income.

This conclusion is consistent with the experience of national newspaper circulation in the UK and, also, other markets which are not characterised by competition from large PSBs. For example, in the United States, Sunday and daily newspaper circulation has declined in ten and eleven of the last twelve years respectively.⁴⁷ Furthermore, between 2008 and 2012, the International Federation of Audit Bureaux of Circulations ('IFABC') data⁴⁸ suggest that circulation has fallen for almost 65 per cent of paid regional and local newspapers across twelve member countries and for more than 85 per cent of paid regional and local titles across sixteen member countries.⁴⁹

A statistical analysis of the data corroborates this view.

5.2 Based on the available data, our econometric analysis finds no evidence that the BBC website crowds out local newspapers

While econometric analysis can help diagnose how factors affect a variable of interest, Figure 16 captures the challenge in trying to unpick what has been the driving force behind the change of local newspaper circulation over time when using econometric techniques. The charts show that both Internet penetration and BBC News website clicks for all news stories have increased over the time

⁴⁷ Newspaper: Fact Sheet (29 April 2015), <http://www.journalism.org/2015/04/29/newspapers-fact-sheet/>, Pew Research Centre.

⁴⁸ The International Federation of Audit Bureaux of Circulations (IFABC) data reports. <http://www.ifabc.org/resources/data-reports%2065/data-reports-65>

⁴⁹ Countries analysed for paid newspapers: Argentina, Brazil, China, Denmark, Finland, Hungary, India, Republic of Korea, Malaysia, Poland, Romania, Serbia, Spain, Sweden, Switzerland and The Netherlands. Countries analysed for free newspapers: Argentina, Belgium, Canada, Denmark, Hungary, Republic of Korea, Poland, Romania, Spain, Sweden and Switzerland and The Netherlands. Titles only included if data for all years between 2008 and 2012 inclusive is available in the IFABC dataset.

period analysed with very similar trends. The correlation between Internet penetration and BBC News website clicks is 88 per cent. The fact that these two variables are so highly correlated means that, even without having conducted any regressions, it will necessarily be difficult to isolate the effects of the BBC from those of general Internet adoption on local newspaper readership and revenues.

This, indeed, proved to be the case when we conducted the regression analysis.

The BBC collects data on website hits overall but does not split these data between local news website hits and other BBC News website hits. We have, therefore, used in our analysis BBC website hits to proxy for hits on local news web pages on the BBC website.

We use Internet penetration as a proxy for the general take-up of the Internet and the use of websites such as eBay, GumTree, ParentMail, Facebook, and so on – all described in Section 2.2.2 above – that compete with a large number of services traditionally provided by local papers.

Our regression analysis included both variables (i.e. BBC website clicks and Internet penetration) and GDP per capita. We expect the latter to influence local newspaper circulation because: i) as incomes fall, people they may choose to buy fewer newspapers; and ii) advertising revenues will fall for both free and paid local print newspapers with a decline in GDP.

We found, in this regression, no statistically significant impact of BBC website hits on local newspaper circulation. However, there was a statistically significant negative effect attributable to Internet penetration.

The analysis, however, relied upon a smaller number of data points (19) than considered preferable (i.e. 30 or more). This is because the BBC News website hits data are available only from 2005 onwards.

Nevertheless, it appears from what data that are available, that Internet penetration holds greater power when explaining changes in local newspaper circulation than BBC News website hits.

The findings from our econometric analysis for local newspaper circulation are consistent with our econometric analysis of local and regional newspaper advertising revenues. In our advertising revenue analysis, we rely upon data between 1998 and 2014. We tested both print advertising revenues and total (i.e. print and online) advertising revenues⁵⁰. We find, across both types of advertising revenue variables analysed, that there is no evidence, based on the available data, of a statistically significant negative effect attributable to BBC News website clicks when, as with our local newspaper circulation analysis, we include Internet penetration and GDP per capita.

This is not unexpected, given the discussion set out in Section 2.2.2; the BBC competes with only a subset of the content and services provided by local papers whereas the Internet arguably competes with all of it.

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We did not attempt to conduct an econometric analysis of online local and regional newspaper advertising revenues as data for online advertising revenues were available between 2011 and 2014 only.

Appendix 1 / Insights from the economic literature regarding dependent and explanatory variables

In the literature that focuses on the crowding out issue, there are several variables that are commonly analysed to assess whether PSBs have a negative (or positive) impact on commercial broadcasters' activity.

Table 2 summarises the measures most typically used to assess the crowding out hypotheses.

Table 2: Variables used in the literature when analysing broadcasting activity

Paper	Variable 1	Variable 2	Variable 3	Variable 4
Berry and Waldfogel (1999)	Listening	Programming format	Entry	Revenues
Anderson and Coate (2000)	Number of viewers			
BBC report (2013)	Revenues			
Buhler and Wey (2013)	Profits/ Revenues			
Oliver (2009)	Audience share	Broadcasting revenues		
Enders - Impact of BBC on Investment (2015)	Revenues			
Enders - The BBC, the press and online news (2015)	Advertising revenues of newspapers			
Gentkow (2006)	Readership			
Graf (2004)	Expenditure on online advertising	Revenue and costs of online services		
Ofcom - Measuring public sector broadcasting	Additional production costs of PSB programmes	Net advertising revenue forgone		
Ohangan and Jennings (2003)	Total number of broadcasting hours for PSB	Total number of broadcaster hours for broadcaster		
Mckinsey (2004)	Quantity of PSB genre	Level of commercial funding	Level of advertising funding	
Ofcom (2004)	Commercial subscription revenues	Commercial advertising revenues		
Barwise and Picard (2014)	Revenues	Investment	Viewer share	
Ofcom (2015)	Viewing			
Barrowclough (2001)	Level of advertising	Broadcaster revenue	Audience size	
Vandervuff (2005)	Channel distinctiveness	Channel open and reflective diversity		
Waldfogel (2002)	Number of stations in each market	Market aggregate television viewing		
Waldfogel (2011)	Available stations by format	Listening by format		

Revenue was the most commonly used variable to analyse the level of broadcasting activity. Five out of the seven papers outlined above used revenues as part of their analysis and other papers, such as reports by Enders⁵¹ and Barrowclough 2001⁵², also used revenues in their consideration of broadcasting markets. Revenues are considered as they can reflect the success of different providers and can be compared easily across PSBs and commercial stations.

Audience numbers were also thought to be a useful representation of broadcaster activity. Three out of seven papers that we were able to find which considered the issue of crowding out used audience numbers to conduct empirical analyses. Others, such as a 2015 report by Ofcom⁵³, comment on audience figures in their assessment of BBC broadcasting.

Programme format was also used on occasion when determining how PSBs affected the diversity of programs on offer. Other commonly used variables include advertising revenue (Minkinsey 2004⁵⁴ and Enders³⁹) and number of stations in each market (Waldfoegel 2002⁵⁵).

The crowding out literature assesses a variety of possible influences on commercial broadcasters' activity as well as the level of activity by PSBs.

Table 3 below provides a summary of the variables considered in a number of the papers we reviewed, in addition to PSB activity. As outlined in Section 3.1, some of these papers rely upon econometric analysis, though others rely upon qualitative and hypothetical research. In the case of studies which use regression analysis, we have included data variables below which are reported in each paper as potentially relevant in explaining possible influences on commercial broadcasters' activity.

The level of investment or funding was most often thought to influence the broadcasting market. Six papers that we reviewed included this variable in their analysis.

Other commonly used variables included education and GDP. Education levels may, for example, influence taste in programme genre and potentially quality.

Although not as common, other papers included age, race and other demographic variables in their empirical studies (Waldfoegel 2002⁴⁸ and 2011⁵⁶). More qualitative papers such as Ohagan and Jennings⁵⁷ (2003), propose that the relative size of the market, number of commercial providers in the country and government regulations are also aspects to consider.

51 Enders 2011, BBC TV- impact on investment in UK content.

52 Barrowclough, 2011, Spilling Over and Crowding Out: The effects of Public sector/ Private sector convergence and competition in the provision of Public Goods.

53 Ofcom, 2015, Public Service Broadcasting in the Internet Age.

54 McKinsey, 2004, Review of Public Service Broadcasting around the world.

55 Waldfoegel 2002, Consumer Substitution among Media, Federal Communications Commission.

56 Waldfoegel, 2011, Station Ownership and the Provision and Consumption of Radio News.

57 Ohagan and Jennings, 2003, Public Broadcasting in Europe: Rationale, License Fee and Other Issues, Journal of Cultural Economics 27: 31-56.

Table 3: Variables identified in the literature that are considered to impose an influence on audience numbers or programme revenues

Paper	Variable 1	Variable 2	Variable 3	Variable 4	Variable 5
Anderson and Coate (2000)	Advertising levels				
Barrowclough (2001)	N/A				
Barwise and Picard (2014)	N/A				
BBC report (2013)	Levels of Investment in originations	Diversity of schedule	Audience perceptions of quality	GDP per capita	
Berry and Waldfogel (1999)	Population	Average income	Distribution of education	Number of colleges and education	
Buhler and Wey (2013)	Investment				
Enders - Impact of BBC on Investment (2015)	Audience / Consumption	Content investment			
Enders - The BBC, the press and online news (2015)	N/A				
Gentkow (2006)	Education	Industry of employment	Income		
Graf (2004)	Investment				
Mckinsey (2004)	Level of public funding per head	GDP	Language spoken		
Ofcom - Measuring public sector broadcasting	N/A				
Ofcom (2004)	Audience share	Take up of pay TV			
Ofcom (2015)	Levels of Investment	Genres			
Ohangan and Jennings (2003)	Public funding for each PSB	Channel categories	Relative size of market	Number of commercial providers in the country	Government regulations
Oliver (2009)	Spending				
Vandervuff (2005)	Number of channels				
Waldfogel (2002)	Age	Education	Gender	Race	
Waldfogel (2011)	Demographic information				

Appendix 2 / Econometric analysis

Summary

We have undertaken a detailed econometric analysis to assess if there is any evidence of crowding out of commercial operators by the presence of the BBC in broadcast markets.

This econometric analysis adds to our review of existing literature in the area and our analysis of historical data trends.

Our econometric analysis concentrates on three particular markets:

- the market for entertainment television broadcasting;
- the market for news television broadcasting; and
- the market for local print newspapers.

This Appendix details the methodology, assumptions, and calculations used in our analysis.

It also summarises the results of the econometric analysis.

Approach

Our econometric analysis was based on the overall regression model specification outlined below. This theoretical equation considers the impact of BBC activity on commercial activity, while controlling for a range of other variables and seasonal factors which could plausibly affect commercial operators.

$$\begin{aligned} \text{Outcome for commercial operators} \\ = \alpha + \beta \text{Activity of BBC} + \gamma \text{Supply of commercial activity} + \phi \text{Macroeconomic factors} \\ + \lambda \text{Demographic factors} + \mu \text{Technological factors} + \theta \text{Seasonal factors} + \delta \text{Other factors} \\ + \varepsilon \end{aligned}$$

Previous academic studies in this area, as well as economic theory, influenced our choice of other variables.

In this specification, a negative and statistically significant 'Activity of BBC' variable would be consistent with – though not necessarily conclusive *proof* of – crowding out by the BBC of commercial activity.

Conversely, if we were to find that the 'Activity of BBC' variable is not statistically significantly different to zero, this would be consistent with the notion that the BBC does not crowd out commercial broadcasters' activity. Again, it would not, however, necessarily be conclusive *proof* of no crowding out since it is possible that:

- there is insufficient variation in the data over the period analysed; and / or
- relatively small changes in BBC activity might have little or no crowding out effects but larger changes might.

If, therefore, the 'Activity of BBC' variables considered in this analysis are not statistically significantly different to zero, the most that can be said is that there is no statistically significant evidence of any crowding out effects in the markets considered over the period analysed.

The different variables used to measure for the factors outlined in the specification and for BBC activity are outlined in the data section below, as well as in the individual regression sections.

In addition to these variables, we also tested a variety of functional specifications including:

- lagged explanatory variables;
- alternative functional forms of explanatory variables (e.g. powers);
- lagged dependent variables; and
- time trends.

In our calculations, we express all prices and economic variables in 'real terms'.

The price of any good or service generally increases over time in line with general inflation and, typically, with increasing incomes. Consumers' demand for any product or service is affected not by changes in the price per se, but in the price of that product or service relative to the price of other products and relative to incomes.

For that reason, when diagnosing how changes in price levels affect the consumption of a product or service, it is common practice to strip out the effects of general inflation and express price changes in 'real terms' i.e. changes in prices over and above the general effects of inflation.

If prices increase in real terms, this means that the price of the product or service being considered has risen faster than the price of other goods and services.

If prices decline in real terms, this means that the price of the product or service being considered has increased by less than the price of other goods and services. It is this, as opposed to the absolute price change, which, it is typically agreed by economists, is likely to influence consumption levels.

The regressions presented in this section are in a 'double log' specification. Often, economists run regressions using a 'double log' regression specification due to the ease of interpretation. This specification is used for convenience as the coefficient on variables is an approximation of the elasticity of demand for that variable. The interpretation of a coefficient in a 'double log' specification is that for a 1 per cent increase in the explanatory variable there will be a corresponding X per cent change in the dependent variable. Our results are consistent whether the analysis is run in logs or levels.

All of our regressions used 'robust standard errors'. This removes any potential problems of heteroskedasticity (explained below in Table 4), if it is present, without affecting the magnitude or sign of the explanatory variables' coefficients.

By no means are all the regressions that were conducted outlined in the subsequent sections of this Appendix; we considered literally hundreds of different options in our analysis, including numerous different functional specifications and combinations of different explanatory variables. In this Appendix, we present what we consider are the most insightful series of regression results. However, we can confirm that none of our conclusions would be changed had we presented the full suite of results from the many different regressions we analysed. Our findings are consistent across many more regression specifications than we have, in the interests of relative brevity, been able to present here.

We used, in line with good practice, a range of econometric diagnostic tests to check the validity of our regression specifications. A description of the potential issues faced by the regressions and the tests used to check for them in this report is outlined in Table 4.

Table 4: Diagnostic tests used to test the quality of regression specifications

	Issue and impact on regression results	How to solve for it
Heteroskedasticity	<ul style="list-style-type: none"> • Non-constant standard errors from a regression model is known as heteroskedasticity. That is, the variance of the error terms is not constant across observations. • Heteroskedasticity does not bias the coefficients estimated by OLS. It does, however, bias our estimates of the standard errors. • Using these incorrect standard errors, which tend to understate the true standard error, will lead to wrong conclusions on the statistical significance of variables in our regression. If we use these incorrect, smaller standard errors, we could conclude that variables are statistically significant when they are, in fact, not. 	<ul style="list-style-type: none"> • Firstly, run specification tests to detect heteroskedasticity (e.g. White's test). • The solution is to use heteroskedastic standard errors.
Functional form, omitted variable bias, biasedness	<ul style="list-style-type: none"> • The omission of an important explanatory variable can lead to biased estimates of the impact of explanatory variables, if the omitted variable is correlated with an explanatory variable included already in the regression. We may, for example, have omitted a term with a higher order such as the square value. • The Ramsey RESET test provides an indication of omitted variable bias. In some cases, when sample sizes are very small, the explanatory power of the RESET test is not strong. If a regression has only dummy variables, the RESET test does not work. 	<ul style="list-style-type: none"> • Try different functional forms of variables (e.g. squared terms) or uncover further explanatory variables. • We have also correlated the residuals with the explanatory variables to see if there is significant correlation.
Serial correlation	<ul style="list-style-type: none"> • OLS standard errors depend on the assumption that observations are independent realisations, whereas, in reality, there could be a level of dependence, where a shock takes several periods to fade (this sometimes happens with stock prices). A positive shock in one will lead to a positive shock in the next one. • With positive serial correlation, OLS estimates of standard errors will be smaller than true standard errors. This could lead to concluding, incorrectly, a variable is statistically significant. 	<ul style="list-style-type: none"> • The first step is to test a regression model for serial correlation. We have used the Durbin-Watson test statistic. • Solutions include using standard errors consistent to correct for this or to use a regression model with an autoregressive feature (Feasible Generalised Least Squares, Prais-Winsten).
Multicollinearity	<ul style="list-style-type: none"> • When explanatory variables in a regression are highly correlated with each other, we cannot separate the effects of the different regressors. Estimators may not represent true effects of variables on the outcome. • In the most extreme case, if two variables are perfectly correlated (i.e. both always equal) the coefficients on each variable cannot be calculated and the software automatically drops one. • We have seen variables that are not an exact linear combination of each other, but are close enough to cause problems with this condition even though coefficients can be calculated. A sign of multicollinearity problems is the presence of coefficients that are individually insignificant but jointly significant. • We tested for the presence of multicollinearity through calculating the Variance Inflation Factor (VIF) which indicates the presence and degree of multicollinearity. 	<ul style="list-style-type: none"> • It is helpful correlate the variables that are suspected to be collinear. • The best solution for this is to decide which variable out of the set of correlated explanatory variables makes most sense to keep in the analysis.
Model significance	<ul style="list-style-type: none"> • A model that, in total, is not statistically significant indicates that we are missing important determinants of our explained outcome. • A model found to be not statistically significantly different from zero provides results that are unlikely to 	<ul style="list-style-type: none"> • Either to re-specify the model (nonlinear, for example) or to try and find better explanatory variables.

Issue and impact on regression results	How to solve for it
be particularly robust or meaningful.	
<ul style="list-style-type: none"> Considering the R-squared, which measures the amount of variability in the data captured by the model, and a joint significance F-test are known methods of understanding model significance. Reviewing the graph of actual data vs predicted data from the model. 	

Data

This section outlines in further detail the data that we have used when conducting the econometric analysis. These data can be grouped into three separate groupings:

- dependent variables;
- explanatory variable to study the impact of BBC activity; and
- other explanatory variables.

Table 5 outlines the data for the dependent variables for each of the three regressions.

Table 6 details the summary statistics for these variables.

Table 5: Data sources for dependent variables used in the econometric analysis

Regression	Dependent variable	Time period	Frequency	Source
News television	Total viewer minutes of commercial broadcaster news television	2002 – 2014	Monthly	BARB
Entertainment television	Total viewer minutes of commercial broadcaster entertainment television	2002 – 2014	Monthly	BARB
Local print newspapers	Total circulation of local print newspapers in the UK	2001 – 2014	Quarterly/ biannual	JICREG
Local newspaper print and online advertising revenue	Total advertising revenue of local newspapers from print and online operations in the UK	1982 – 2014	Quarterly	WARC

Table 6: Summary statistics for dependent variables used in the econometric analysis

Variable	Observations	Mean	St. Dev	Min	Max
Commercial broadcaster news viewer minutes	156	12,700,000	3,057,681	6,188,666	27,700,000
Commercial broadcaster entertainment viewer minutes	156	38,400,000	10,900,000	17,500,000	66,100,000
Circulation of local print newspapers	33	30,800,000	6,370,704	16,100,000	36,400,000
Total advertising revenue from local newspaper's print and online operations	110	563,000,000	168,000,000	232,000,000	815,000,000

Table 7 shows our BBC explanatory variables which we have used to assess crowding out for each of the four regressions.

Table 8 details the summary statistics for these variables.

Table 7: Data sources for the activity of BBC variables used in the econometric analysis

Regression	BBC explanatory variable	Time period	Frequency	Source
News television	Total broadcast minutes of BBC news television	2002 – 2014	Monthly	BARB
	Spending by BBC per broadcast minute of news television	2002 – 2014	Annual	Ofcom / BBC
Entertainment television	Total broadcast minutes of BBC entertainment television	2002 – 2014	Monthly	BARB
	Spending by BBC per broadcast minute of entertainment television	2002 – 2014	Annual	Ofcom / BBC
Local print newspaper circulation	Total clicks on BBC News website	2005 – 2014	Monthly	BBC
Local newspaper print and online advertising revenue	Total clicks on BBC News website	2005 – 2014	Monthly	BBC

Table 8: Summary statistics for the activity of BBC variables used in the econometric analysis

Variable	Observations	Mean	St. Dev	Min	Max
BBC news broadcast minutes	156	69,556	3,892	62,559	81,042
BBC entertainment broadcast minutes	156	16,502	13,431	8,800	175,617
Total BBC spending on television programming	12	1,635,704	203,657	1,315,386	1,910,768
BBC online clicks	113	1,470,000,000	625,000,000	591,000,000	3,050,000,000

The available data on BBC content expenditure does not differentiate between broadcast categories. We have used total BBC spending as a proxy for entertainment and news television spending. This requires the implicit assumption that a 10 per cent increase in the total spend by the BBC leads to a 10 per cent increase in the spending on BBC entertainment and news television. We generated the BBC spending variables per broadcast minute by taking the BBC spending, applying it on a quarterly basis, then dividing by broadcast minutes for news and entertainment respectively.

As outlined in our approach, along with a variable to assess the impact / activity of the BBC, we tested a range of variables which may also influence commercial activity in the broadcasting and local newspaper markets. These include variables covering technological change, macroeconomic factors, and the availability of substitutes.

Table 9 outlines the data used for these additional explanatory variables.

Table 10 details the summary statistics for these variables.

Table 9: Data sources for other explanatory variables used in the econometric analysis

Variable type	Variable description	Time period	Frequency	Source
GDP per capita	Real GDP per capita in 2011 prices	1998 – 2014	Quarterly	ONS
Internet penetration	Households with internet access, quarterly between 1998 and 2004 followed by linear interpolation to quarterly frequency from 2005 onwards	1998 – 2014	Quarterly / Annual	ONS
Commercial news broadcast minutes	Total broadcast minutes of news television by commercial operators	2002 – 2014	Monthly	BARB
Commercial entertainment broadcast minutes	Total broadcast minutes of entertainment television by commercial operators	2002 – 2014	Monthly	BARB

Table 10: Summary statistics for other explanatory variables used in the econometric analysis

Variable	Observations	Mean	St. Dev	Min	Max
GDP per capita (real terms)	68	24,797	1,572	21,188	26,868
Internet penetration	38	43	22	9	84
Commercial news broadcast minutes	156	74,052	11,874	16,615	93,799
Commercial entertainment broadcast minutes	156	192,148	41,388	114,907	266,662

We present the detailed results from our econometric analysis for each of the three markets (news television broadcasting; entertainment television broadcasting; and the market for local print newspapers), in turn, in the rest of this Appendix.

Econometric analysis of the impact of BBC entertainment television viewing on commercial broadcasting news television viewing

Summary of results

Table 11 provides an overarching summary of all of the regressions presented in this section of the Appendix.

Table 11: Summary results of entertainment broadcasting regression analysis⁵⁸

Variable	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6
BBC entertainment broadcast minutes			-0.435	-0.625**	0.0715*	
BBC spend per minute of entertainment broadcast			-0.503	-0.698**		-0.0762*
Commercial entertainment broadcast minutes		0.447***	0.492***	0.472***	0.479***	0.484***
GDP per capita (real terms)		-1.026**	-0.610		-0.918**	-0.863**
Time trend	0.0101***	0.00560***	-6.04e-05	-0.00281	0.00467**	0.00389*
Dummy for Q2	-0.165***	-0.155***	-0.148***	-0.148***	-0.152***	-0.151***
Dummy for Q3	-0.269***	-0.251***	-0.247***	-0.246***	-0.255***	-0.254***
Dummy for Q4	0.158***	0.149***	0.145***	0.149***	0.134***	0.134***
Dummy for post 2010	0.106***	0.0996**	0.103***	0.131***	0.0945**	0.0954**
Constant	18.13***	22.81***	24.70***	21.61***	20.56***	21.02***
Observations	52	52	52	52	52	52
R-squared	0.906	0.940	0.946	0.944	0.944	0.945
Durbin Watson	1.292	1.717	1.774	1.757	1.645	1.665
Ramsey RESET	0.323	0.599	0.559	0.561	0.611	0.609
VIF	2.31	3.68	40.78	36.41	3.54	3.79

In addition to the regressions outlined, we also tested a wide range of possible alternatives including other explanatory variables and different specifications. The results of these regressions were not

⁵⁸ Explanatory variables denoted by *** are statistically significantly different to zero at the 99% level of confidence. Explanatory variables denoted by ** and * are statistically significantly different to zero at the 95% and 90% levels of confidence respectively.

preferable, statistically, to the analysis presented below and do not alter the conclusions of our analysis.

Outline of approach

This section considers whether the BBC crowds out commercial broadcasters in the entertainment television sector.

Our analysis uses data covering the period between Quarter 1 2002 and Quarter 4 2014, resulting in a total of 52 observations.

Our dependent variable is the total number of minutes of viewing of commercial broadcasters' entertainment television programmes in each quarter. We use this measure to capture the total size of the market that is taken up by commercial broadcasters.

Our definition of crowding out refers to the hypothesis that BBC broadcasting leads to a fall in commercial channels' entertainment television audiences. We considered two potential measures of BBC activity that could lead to crowding out in this case:

- the total number of minutes of entertainment television broadcast by the BBC (which captures the total supply of entertainment television to the public by the BBC); and / or
- BBC spending per minute of BBC entertainment television broadcasting (which potentially captures the quality of BBC's output, which might attract a larger audience all other things being equal).

Should an increase in either or both of these values, representing higher levels of activity by the BBC, lead to crowding out, this would manifest itself with a negative coefficient in the regression equation.

The available data on BBC expenditure on content does not differentiate between broadcast categories, so we have used total BBC spending as a proxy for entertainment television spending. This requires the implicit assumption that a 10 per cent increase in the total spend by the BBC leads to a 10 per cent increase in the spending on BBC entertainment television.

The regressions below also include a number of other explanatory variables. These are:

- quarterly dummy variables to account for any seasonal variation;
- a time trend to account for any general trend between years, for instance through the effects of technological factors such as increasing internet and digital penetration;
- GDP per capita to account for any wider macroeconomic trends;
- a dummy variable for 2010 onwards to account for a step change in commercial news viewing caused by a change in the measurement technique of the data used; and
- broadcast minutes of entertainment television by commercial operators (which captures total supply of entertainment television to the public by commercial operators).⁵⁹

The regression results and diagnostic tests are outlined in the following sections.

⁵⁹ There was an unexplained spike in entertainment broadcast hours in two of the months of June, July and August 2014. For the purpose of the econometric analysis presented in this Appendix, we do not make any adjustment for this.

Regression 1: Regression with dummies including seasonal variation, time trend and 2010 dummy

Regression 1 presents our starting point for studying the impact of BBC activity on commercial broadcast entertainment television. This regression seeks to establish how much variation in viewing minutes of commercial news television is explained by seasonality, annual trends (for instance brought on by technological change and population growth) and any other data specific factors. The full list of explanatory variables used in this regression are:

- dummy variables to account for seasonal variation;
- a time trend; and
- a dummy variable for 2010 onwards.

The results for Regression 1 are outlined in Table 12. In addition, the diagnostic tests are outlined in Table 13.

The dummy variable for 2010 was included as we were informed, by BARB, that the measurement methodology of the data underwent a one-off permanent change during this period.

The results indicate that seasonal variation and annual trends account for a large proportion of the variation commercial news television viewer minutes, with a reported R-squared of 0.91. The time trend is positive and statistically significant at a 1 per cent significance level, indicating a small general increase in commercial entertainment television viewer minutes over time, possibly brought on by technological factors. The quarterly dummy variables are all statistically significant at a 1 per cent significance level, with the Q2 and Q3 dummy variables displaying a negative coefficient and the Q4 dummy displaying a positive coefficient. The dummy for post 2010 onwards is positive and statistically significant at the 1 per cent significance level.

The regression passes the Ramsey RESET test. The Durbin Watson test, which is below the lower bound critical statistic at a 5 per cent significance level, indicates the presence of autocorrelation. A VIF of below 4 indicates low or no multicollinearity.

Table 12: Results for Regression 1 with commercial entertainment television viewing minutes as the dependent variable

Variable	Coefficient
Time trend	0.0101***
Dummy for Q2	-0.165***
Dummy for Q3	-0.269***
Dummy for Q4	0.158***
Dummy for post 2010	0.106***
Constant	18.13***

Table 13: Diagnostic tests for Regression 1 with commercial entertainment television viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.906
Durbin Watson statistic for Autocorrelation	1.292
Ramsey RESET test for omitted variable bias	0.323
VIF for multicollinearity	2.31

Regression 2: Baseline regression with seasonal variation, time trend, 2010 dummy and GDP per capita

Regression 2 presents our baseline regression. It builds on Regression 1 by further including:

- GDP per capita, to account for macroeconomic trends; and
- commercial television entertainment broadcast minutes, as a measure of supply of entertainment TV by commercial operators.

The results for Regression 2 are outlined in Table 14. In addition, the diagnostic tests are outlined in Table 15.

Results for all variables except GDP per capita and commercial entertainment broadcast minutes remain consistent with Regression 1. All of the variables maintain the same sign, although with a small change in coefficient magnitude. All variables that were statistically significant in Regression 1 remain so at the same significance levels, except for the post 2010 dummy variable which maintains statistical significance at a 5 per cent significance level.

The GDP per capita variable itself is negative and statistically significant at a 5 per cent significance level. This might appear, at first blush, counterintuitive. However, there could be some economic logic to this result e.g. if consumers choose to stay at home and watch TV rather during an economic downturn as the affordability of other alternative leisure activities outside of the home declines with falling incomes (i.e. entertainment television might be viewed as an inferior good).

The commercial entertainment broadcast minutes variable is positive and statistically significant at a 1 per cent significance level.

Regression 2 passes the Ramsey RESET test. The Durbin Watson test statistic, although higher than Regression 1, sits between the lower and upper bound of the critical statistic, with an inconclusive result. A VIF of below 4 indicates low or no multicollinearity.

Our baseline regression is statistically well-specified and accounts for 94 per cent of the variation in commercial entertainment television viewer minutes. In the following three regressions, we include variables to account for BBC activity in order to test if there is any statistically significant evidence of an impact on commercial entertainment television viewer minutes.

Table 14: Results for Regression 2 with commercial entertainment television viewing minutes as the dependent variable

Variable	Coefficient
Commercial entertainment broadcast minutes	0.447***
GDP per capita (real terms)	-1.026**
Time trend	0.00560***
Dummy for Q2	-0.155***
Dummy for Q3	-0.251***
Dummy for Q4	0.149***
Dummy for post 2010	0.0996**
Constant	22.81***

Table 15: Diagnostic tests for Regression 2 with commercial entertainment television viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.940
Durbin Watson statistic for Autocorrelation	1.717
Ramsey RESET test for omitted variable bias	0.599
VIF for multicollinearity	3.68

Regression 3: Baseline regression including BBC broadcast minutes of entertainment television and BBC spending on entertainment television

Regression 3 presents our baseline regression with the inclusion of two variables which capture BBC activity in the market. The BBC variables in this regression are:

- BBC broadcast minutes of entertainment television (which captures the total supply of entertainment television to the public by the BBC); and
- BBC spending per minute of broadcast entertainment (which potentially captures the quality of BBC's output, which might attract a larger audience all other things being equal).

The results for Regression 3 are outlined in Table 16. In addition, the diagnostic tests are outlined in Table 17.

Results for the quarterly dummy variables and commercial broadcast minutes of entertainment television remain consistent with Regression 2. All variables remain statistically significant at a 1 per cent significance level and maintain the same sign, although with some small changes to the coefficient magnitude. The results for the post 2010 dummy variable also remains consistent with Regression 2, although it is statistically significant at a 1 per cent significance level in Regression 3.

GDP per capita and the time trend appear to indicate the presence of instability when comparing Regression 3 to Regression 2. GDP per capita remains negative but loses statistical significance and experiences a notable fall of coefficient magnitude. The time trend variable also loses statistical significance at any recognised significance level, with the coefficient sign changing from positive to negative. Table 11 demonstrates the instability of these variables and the presence, and effect, of multicollinearity in the regression.

Both the BBC broadcast minutes variable and the BBC spending per minute of broadcast news variable have a negative coefficient but are not statistically significant at any recognised significance level. These results are consistent with the finding of no evidence, from the data analysed, that BBC activity, whether that be the supply of BBC news television or spending on BBC news television, crowds out commercial activity in the news television market.

However, the statistical reliability of the Regression 3 is questionable. Although it passes the Ramsey RESET test and maintains an inconclusive result for the Durbin Watson (similar to Regression 2), a VIF of 40.78 indicates the presence of very high collinearity between explanatory variables, at over 10 times the critical statistic of 4. In particular, the individual VIF statistics are large for BBC spend per minute of entertainment broadcast (186.06), BBC broadcast minutes of entertainment (124.73) and the time trend (38.68). This indicates the presence of very high collinearity between these variables. This collinearity is unsurprising for the logged versions of spending per broadcast minute and broadcast minutes since they are have a correlation coefficient of -95 per cent.

The high multicollinearity, along with unstable coefficients for the time trend, GDP per capita and BBC broadcast minutes of entertainment television variables, means that we are unable to rely on

this regression to answer the question of crowding out. This means, in turn, that Regression 3 does not – either in terms of the coefficient values or the reliability of the regression – provide evidence of the presence of crowding out by the BBC in entertainment broadcasting.

Table 16: Results for Regression 3 with commercial entertainment television viewing minutes as the dependent variable

Variable	Coefficient
BBC entertainment broadcast minutes	-0.435
BBC spend per minute of entertainment broadcast	-0.503
Commercial entertainment broadcast minutes	0.492***
GDP per capita (real terms)	-0.610
Time trend	-6.04e-05
Dummy for Q2	-0.148***
Dummy for Q3	-0.247***
Dummy for Q4	0.145***
Dummy for post 2010	0.103***
Constant	24.70***

Table 17: Diagnostic tests for Regression 3 with commercial entertainment television viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.946
Durbin Watson statistic for Autocorrelation	1.774
Ramsey RESET test for omitted variable bias	0.559
VIF for multicollinearity	40.78

Regression 4: Baseline regression excluding GDP per capita and including BBC broadcast minutes of entertainment television and BBC spending on entertainment television

As GDP per capita was not statistically significant in the case of Regression 3, we considered a second regression which presented Regression 3 but excludes GDP per capita. The results for Regression 4 are outlined in Table 18. In addition, the diagnostic tests are outlined in Table 19.

Results for Regression 4 are consistent with Regression 3 with respect to coefficient signs and statistical significance for all variables except BBC entertainment broadcast minutes and BBC spending per minute of broadcast entertainment television. In Regression 4, these two variables are both negative and become statistically significant at a 5 per cent significance level, potentially indicating crowding out by the BBC.

However, as with Regression 3, Regression 4 displays instability for the time trend and BBC broadcast entertainment television variables. In addition, a VIF of 36.41 indicates very high collinearity between explanatory variables, *at over 9 times the critical statistic of 4*. Again, the individual VIF statistics are particularly high for BBC spend per minute of entertainment broadcast (149.74), BBC broadcast minutes of entertainment (102.12) and the time trend (26.11), indicating very high collinearity between these variables.

The high multicollinearity, along with unstable coefficients for the time trend and BBC broadcast minutes of entertainment television variables, means that this regression should not be relied upon

as evidence of the existence, or otherwise, of crowding out. Regression 4 does not, therefore, provide any statistically reliable evidence of the presence of crowding out by the BBC in entertainment television.

Table 18: Results for Regression 4 with commercial entertainment television viewing minutes as the dependent variable

Variable	Coefficient
BBC entertainment broadcast minutes	-0.625**
BBC spend per minute of entertainment broadcast	-0.698**
Commercial entertainment broadcast minutes	0.472***
Time trend	-0.00281
Dummy for Q2	-0.148***
Dummy for Q3	-0.246***
Dummy for Q4	0.149***
Dummy for post 2010	0.131***
Constant	21.61***

Table 19: Diagnostic tests for Regression 4 with commercial entertainment television viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.944
Durbin Watson statistic for Autocorrelation	1.757
Ramsey RESET test for omitted variable bias	0.561
VIF for multicollinearity	36.41

The following two regressions, Regression 5 and Regression 6, analyse the independent impact of the two BBC activity variables on viewing minutes of commercial entertainment television in order to analyse the impact when removing the issue of multicollinearity.

Regression 5: Baseline regression including a variable of BBC broadcast minutes of entertainment television

Regression 5 presents our baseline regression with the inclusion of a variable capturing BBC activity in the market. The BBC variable in this regression is BBC broadcast minutes of entertainment television, a measure of BBC supply into the market. The results for Regression 5 are outlined in Table 20. In addition, the diagnostic tests are outlined in Table 21.

Regression 5 passes the Ramsey RESET test. The Durbin Watson test statistic, although lower than Regression 2, sits between the lower and upper bound of the critical statistic, with an inconclusive result. A VIF of below 4 indicates low or no multicollinearity.

Results for all variables except BBC broadcast minutes of entertainment television remain consistent with Regression 2, with all variables remaining statistically significant at the same significance levels and maintaining the same sign, although with small changes to coefficient magnitude. The BBC broadcast minutes of entertainment television variable has a *positive* coefficient and is statistically significant at the 10 per cent significance level, indicating weak statistical significance. This is consistent with there being no evidence, from the data analysed, that BBC activity crowds out commercial activity in the entertainment broadcasting market.

Table 20: Results for Regression 5 with commercial entertainment television viewing minutes as the dependent variable

Variable	Coefficient
BBC entertainment broadcast minutes	0.0715*
Commercial entertainment broadcast minutes	0.479***
GDP per capita (real terms)	-0.918**
Time trend	0.00467**
Dummy for Q2	-0.152***
Dummy for Q3	-0.255***
Dummy for Q4	0.134***
Dummy for post 2010	0.0945**
Constant	20.56***

Table 21: Diagnostic tests for Regression 5 with commercial entertainment television viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.944
Durbin Watson statistic for Autocorrelation	1.645
Ramsey RESET test for omitted variable bias	0.611
VIF for multicollinearity	3.54

Regression 6: Baseline regression including BBC spending on entertainment television

Regression 6 presents our baseline regression with the inclusion of a variable capturing BBC activity in the market. The BBC variable in this regression is BBC spend per broadcast minute of entertainment television, a measure which seeks to capture the quality of BBC programming. The results for Regression 6 are outlined in Table 22. The diagnostic tests are outlined in Table 23.

Regression 6 passes the Ramsey RESET test. The Durbin Watson test statistic again presents an inconclusive result. A VIF of below 4 indicates low or no multicollinearity.

Results for all variables except BBC broadcast minutes of entertainment television remain consistent with Regression 2, with all variables remaining statistically significant at the same significance levels and maintaining the same sign, although with small changes to coefficient magnitude.

BBC spending on entertainment television programmes appears to have a weak statistically significant negative impact on commercial broadcast minutes of entertainment (at a 10 per cent significance level). We do not consider that this is sufficiently strong evidence of crowding out because:

- the coefficient on the BBC's spending on entertainment broadcasting has only a weak statistical significance in explaining changes in commercial broadcasters' entertainment viewer hours;
- the size of the coefficient is very small, indicating that a 1 per cent increase in BBC spending on entertainment television would lead to a 0.08 per cent decrease in commercial viewing minutes of entertainment television; and
- *critically*, the finding is not robust to changes in the regression specification – for us to be confident of any regression coefficients, we would want estimates to remain invariant to

changes in the regression functional form and / or when different explanatory variables are added (neither of which hold in this case).

It is, therefore, not possible to conclude, from this regression, that there is any statistically significant relationship between BBC activity in entertainment broadcasting and commercial broadcasters' entertainment viewer hours.

Table 22: Results for Regression 6 with commercial entertainment television viewing minutes as the dependent variable

Variable	Coefficient
BBC spend per minute of entertainment broadcast	-0.0762*
Commercial entertainment broadcast minutes	0.484***
GDP per capita (real terms)	-0.863**
Time trend	0.00389*
Dummy for Q2	-0.151***
Dummy for Q3	-0.254***
Dummy for Q4	0.134***
Dummy for post 2010	0.0954**

Table 23: Diagnostic tests for Regression 6 with commercial entertainment television viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.945
Durbin Watson statistic for Autocorrelation	1.665
Ramsey RESET test for omitted variable bias	0.609
VIF for multicollinearity	3.79

Econometric analysis of the impact of BBC news television viewing on commercial broadcasting news television viewing

Summary of results

Table 24 provides a summary of our regressions of the impact of BBC news television viewing on commercial broadcasting news television viewing. As with our analysis of news broadcasting, we in addition tested a very large number of additional regressions, including other explanatory variables and different specifications. They do not alter the conclusions of our analysis and, in the interests of brevity, we do not present the results of the numerous alternative regressions we considered in this paper.

Table 24: Summary results of news broadcasting regression analysis

Variable	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
BBC news broadcast minutes			0.430	-0.358	
BBC spend per minute of news broadcast			0.622*		0.382
Commercial news broadcast minutes		0.224***	0.301***	0.240***	0.283***
GDP per capita (real terms)		1.097***	0.704**	1.052***	0.822**
Time trend	-0.00931***	-0.0121***	-0.00601*	-0.0112***	-0.00773**
Dummy for Q2	-0.121***	-0.117***	-0.120***	-0.117***	-0.119***
Dummy for Q3	-0.0883***	-0.0914***	-0.0974***	-0.0852***	-0.0905***
Dummy for Q4	-0.0214	-0.0147	-0.0238	-0.00970	-0.0166
Dummy for 2003 Iraq war	0.188***	0.195***	0.208***	0.219***	0.221***
Dummy for post 2010	-0.135***	-0.0901***	-0.103***	-0.0899***	-0.0979***
Constant	17.93***	4.140	0.380	8.750	5.232
Observations	52	52	52	52	52
R-squared	0.920	0.949	0.953	0.950	0.953
Durbin Watson	0.934	1.347	1.380	1.401	1.399
Ramsey RESET	0.615	0.172	0.322	0.241	0.349
VIF	2.18	2.59	13.04	2.89	6.51

Outline of approach

Our analysis uses data covering the period between Quarter 1 2002 and Quarter 4 2014, resulting in a total of 52 observations.

The dependent variable is the total number of minutes of viewing of commercial broadcasters' news programmes in each quarter. We use this measure to capture the total size of the market that is taken up by commercial broadcasters.

Our definition of crowding out refers to the hypothesis that BBC broadcasting leads to a fall in commercial channels' news audiences. We considered two potential measures of BBC activity that could lead to crowding out:

- the total number of minutes of news broadcast by the BBC (which captures the total supply of news television to the public by the BBC); and
- BBC spending per minute of BBC news programme broadcasting (which potentially captures the quality of BBC's output, which might attract a larger audience all other things being equal).

Should an increase in either of these values, representing higher levels of activity by the BBC, lead to crowding out, this would manifest itself with a negative coefficient in the regression equation.

The available data on BBC expenditure on content does not differentiate between broadcast categories, so we have used total BBC spending as a proxy for news spending. This requires the implicit assumption that a 10 per cent increase in the total spend by the BBC leads to a 10 per cent increase in the spending on BBC news.

The regressions below also include, variously, a number of other explanatory variables. These are:

- quarterly dummy variables to account for any seasonal variation;
- a time trend to account for any general trend between years, for instance through the effects of technological factors such as increasing internet and digital penetration;
- GDP per capita to account for any wider macroeconomic trends;
- a dummy variable for 2010 onwards to account for a step change in commercial news viewing caused by a change in the measurement technique of the data used;
- an event dummy variable for two quarters of 2003 when viewing minutes of television news increased substantially as a result of the start of the invasion of Iraq; and
- broadcast minutes of news television by commercial operators (which captures total supply of news television to the public by commercial operators) ⁶⁰.

The regression results and diagnostic tests are outlined in the following sections.

Regression 1: Regression with dummies including seasonal variation, time trend, 2010 dummy variable and Iraq war dummy variable

Regression 1 presents our starting point for studying the impact of BBC activity on commercial broadcast news television. This regression seeks to establish how much variation in viewing minutes of commercial news television is explained by seasonality, annual trends (for instance brought on by technological change and population growth) and any other data specific factors.

The full list of explanatory variables used in this regression are:

- dummy variables to account for seasonal variation;
- a time trend;

⁶⁰ There is significant variation in commercial broadcasters' broadcast hours in 2014. For the purpose of the econometric analysis presented in this Appendix, we make no adjustment to the underlying raw data.

- a dummy variable for 2010 onwards; and
- a dummy variable for the Iraq war.

Table 25 shows the results of our regression analysis and Table 26 outlines the findings from our diagnostic testing.

The results indicate that seasonal variation and annual trends account for a large proportion of the variation in commercial news television viewer minutes, with a reported R-squared of 0.92. The time trend is negative and statistically significant at a 1 per cent significance level, indicating a small general decline in commercial news television viewer minutes over time, possibly brought on by technological factors. The quarterly dummy variables are all negative with the Q2 and Q3 dummy variables displaying statistical significance at a 1 per cent significance level, whilst the dummy variable for Q4 is not statistically significant. In addition, the dummy variable accounting for coverage of the Iraq war is positive and statistically significant at a 1 per cent significance level. The dummy variable for 2010 onwards is negative and statistically significant at a 1 per cent significance level.

The regression passes the Ramsey RESET test. The Durbin Watson test, which is below the lower bound critical statistic at a 5 per cent significance level, indicates the presence of autocorrelation. A VIF of below 4 indicates low or no multicollinearity.

Table 25: Results for Regression 1 with commercial news viewing minutes as the dependent variable⁶¹

Variable	Coefficient
Time trend	-0.00931***
Dummy for Q2	-0.121***
Dummy for Q3	-0.0883***
Dummy for Q4	-0.0214
Dummy for 2003 Iraq war	0.188***
Dummy for post 2010	-0.135***
Constant	17.93***

Table 26: Diagnostic tests for Regression 1 with commercial news viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.920
Durbin Watson statistic for Autocorrelation	0.934
Ramsey RESET test for omitted variable bias	0.615
VIF for multicollinearity	2.18

61 Explanatory variables denoted by *** are statistically significantly different to zero at the 99% level of confidence. Explanatory variables denoted by ** and * are statistically significantly different to zero at the 95% and 90% levels of confidence respectively.

Regression 2: Baseline regression with seasonal variation, time trend, 2010 dummy variable, Iraq war dummy variable, GDP per capita and commercial news broadcast minutes

Regression 2 presents our baseline regression. It builds on Regression 1 by further including:

- GDP per capita, to account for macroeconomic trends; and
- Commercial broadcast news television, as a measure of supply by commercial operators.

The results for Regression 2 are outlined in Table 27. In addition the diagnostic tests are outlined in Table 28.

Results for all variables except GDP per capita and commercial news broadcast minutes remain consistent with Regression 1. All of the variables maintain the same sign, although with a small change in coefficient magnitude. All variables that were statistically significant in Regression 1 remain so at the same significance levels. The GDP per capita variable itself is positive, as would be expected through applying economic intuition, and statistically significant at a 1 per cent significance level. The commercial news broadcast minutes variable is also positive and statistically significant at a 1 per cent significance level.

Regression 2 passes the Ramsey RESET test. The Durbin Watson test statistic, although higher than Regression 1, sits between the lower and upper bound of the critical statistic, with an inconclusive result. A VIF of below 4 indicates low or no multicollinearity.

Our baseline regression is statistically well-specified and accounts for 95 per cent of the variation in commercial news television viewer minutes. In the following three regressions, we include variables to account for BBC activity in order to test if there is any statistically significant evidence of an impact on commercial news television viewer minutes.

Table 27: Results for Regression 2 with commercial news viewing minutes as the dependent variable

Variable	Coefficient
Commercial news broadcast minutes	0.224***
GDP per capita (real terms)	1.097***
Time trend	-0.0121***
Dummy for Q2	-0.117***
Dummy for Q3	-0.0914***
Dummy for Q4	-0.0147
Dummy for 2003 Iraq war	0.195***
Dummy for post 2010	-0.0901***
Constant	4.140

Table 28: Diagnostic tests for Regression 2 with commercial news viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.949
Durbin Watson statistic for Autocorrelation	1.347
Ramsey RESET test for omitted variable bias	0.172
VIF for multicollinearity	2.59

Regression 3: Baseline regression including BBC broadcast minutes of news television and BBC spending on news television

Regression 3 presents our baseline regression with the inclusion of two variables which capture BBC activity in the market. The BBC variables in this regression are:

- BBC broadcast minutes of news television (which captures the total supply of news television to the public by the BBC); and
- BBC spending per minute of broadcast news (which potentially captures the quality of BBC's output, which might attract a larger audience all other things being equal).

The results for Regression 3 are outlined in Table 29. In addition, the diagnostic tests are outlined in Table 30.

Regression 3 passes the Ramsey RESET test. The Durbin Watson test statistic, although higher than Regression 2, still sits between the lower and upper bound of the critical statistic, with an inconclusive result. A VIF of 13.04 indicates high collinearity between explanatory variables. In particular there is high collinearity between BBC spend per minute of news broadcast, the time trend and BBC broadcast minutes of news.

Results for all variables except BBC broadcast minutes of news television remain consistent with Regression 2, with all variables maintaining the same sign, although with a small change in coefficient magnitude, and those which were statistically significant remaining so at the same significance levels, except for GDP per capita and the time trend which maintain significance at 5 per cent and 10 per cent significance levels respectively.

The variable for BBC broadcast minutes of news television has a positive coefficient, the opposite of what we would expect to see in the case of crowding out, and is not statistically significant at any recognised significance level.

The variable for BBC spending per minute of broadcast news has a positive coefficient, the opposite of what we would expect to see in the case of crowding out, and is statistically significant at the 10 per cent significance level.

These results indicate that there is no evidence, from the data analysed, that BBC activity, whether that be supply of BBC news television or spending on BBC news television, crowds out commercial activity in the news broadcasting market.

Table 29: Results for Regression 3 with commercial news viewing minutes as the dependent variable

Variable	Coefficient
BBC news broadcast minutes	0.430
BBC spend per minute of news broadcast	0.622*
Commercial news broadcast minutes	0.301***
GDP per capita (real terms)	0.704**
Time trend	-0.00601*
Dummy for Q2	-0.120***
Dummy for Q3	-0.0974***
Dummy for Q4	-0.0238
Dummy for 2003 Iraq war	0.208***
Dummy for post 2010	-0.103***
Constant	0.380

Table 30: Diagnostic tests for Regression 3 with commercial news viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.953
Durbin Watson statistic for Autocorrelation	1.380
Ramsey RESET test for omitted variable bias	0.322
VIF for multicollinearity	13.04

The following two regressions, Regression 4 and Regression 5, analyse the independent impact of the two BBC activity variables on viewing minutes of commercial news television in order to analyse the impact when attempting to solve the problem of multicollinearity.

Regression 4: Baseline regression including a variable of BBC broadcast minutes of news television

Regression 4 presents our baseline regression with the inclusion of a variable capturing BBC activity in the market. The BBC variable in this regression is BBC broadcast minutes of news television, a measure of BBC supply into the market. The results for Regression 4 are outlined in Table 31. In addition, the diagnostic tests are outlined in Table 32.

Regression 4 passes the Ramsey RESET test. The Durbin Watson test statistic, although higher than Regression 2, still sits between the lower and upper bound of the critical statistic, with an inconclusive result. A VIF of below 4 indicates low or no multicollinearity.

Results for all variables except BBC broadcast minutes of news television remain consistent with Regression 2, with all variables maintaining the same sign, although with a small change in coefficient magnitude, and those which were statistically significant remaining so at the same significance levels. The BBC broadcast minutes of news television variable has a negative coefficient and is not statistically significant at any recognised significance level. This indicates that there is no evidence, from the data analysed, that BBC activity crowds out commercial activity in the news broadcasting market.

Table 31: Results for Regression 4 with commercial news viewing minutes as the dependent variable

Variable	Coefficient
BBC news broadcast minutes	-0.358
Commercial news broadcast minutes	0.240***
GDP per capita (real terms)	1.052***
Time trend	-0.0112***
Dummy for Q2	-0.117***
Dummy for Q3	-0.0852***
Dummy for Q4	-0.00970
Dummy for 2003 Iraq war	0.219***
Dummy for post 2010	-0.0899***
Constant	8.750

Table 32: Diagnostic tests for Regression 4 with commercial news viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.950
Durbin Watson statistic for Autocorrelation	1.401
Ramsey RESET test for omitted variable bias	0.241
VIF for multicollinearity	2.89

Regression 5: Baseline regression including BBC spending on news television

Regression 5 presents our baseline regression with the inclusion of a variable capturing BBC activity in the news broadcasting market. The BBC variable in this regression is BBC spend per broadcast minute of news television, a measure which seeks to capture the quality of BBC programming. The results for Regression 5 are outlined in Table 33. In addition, the diagnostic tests are outlined in Table 34.

Regression 5 passes the Ramsey RESET test. The Durbin Watson test statistic sits between the lower and upper bound of the critical statistic, with an inconclusive result. The introduction of the BBC spending per broadcast minute of news television variable results in an increase in the mean VIF to 6.51. This indicates the presence of medium to high collinearity between explanatory variables. However, most of the collinearity is between the BBC spend per broadcast minute of news variable and the time trend.

Results for all variables except BBC spend per broadcast minute of news television remain consistent with Regression 2, with all variables maintaining the same sign, although with a small change in coefficient magnitude. All variables remain statistically significant at the same levels except for GDP per capita and the time trend which maintain statistical significance at a 5 per cent significance level. The BBC spend per minute of news television variable has a positive coefficient but is not statistically significant at any recognised significance level. This, again, indicates that there is no evidence, from the data analysed, that BBC activity crowds out commercial activity in the news broadcasting market.

Table 33: Results for Regression 5 with commercial news viewing minutes as the dependent variable

Variable	Coefficient
BBC spend per minute of news broadcast	0.382
Commercial news broadcast minutes	0.283***
GDP per capita (real terms)	0.822**
Time trend	-0.00773**
Dummy for Q2	-0.119***
Dummy for Q3	-0.0905***
Dummy for Q4	-0.0166
Dummy for 2003 Iraq war	0.221***
Dummy for post 2010	-0.0979***
Constant	5.232

Table 34: Diagnostic tests for Regression 5 with commercial news viewing minutes as the dependent variable

Diagnostic tests	
Number of observations	52
R-squared	0.953
Durbin Watson statistic for Autocorrelation	1.399
Ramsey RESET test for omitted variable bias	0.349
VIF for multicollinearity	6.51

Econometric analysis of the impact of BBC online news on local print newspaper circulation

Outline of approach

The premise being tested in this analysis is whether BBC online activity has crowded out local print newspaper circulation.

Our dependent variable is circulation of local print newspapers. This was aggregated from average circulation of a list of local newspapers which cover 90 per cent of the local print newspaper market in Great Britain (England, Wales and Scotland) by titles.

We have used BBC News website clicks (excluding World Service) to assess the impact of BBC activity on local newspaper circulation. A negative and statistically significant coefficient on this variable might be consistent with the BBC's activity crowding out local newspapers.

We have also tested other explanatory variables to explain macroeconomic and technological factors which may influence consumption of local print newspapers. These are:

- GDP per capita captures general macroeconomic trends; and
- Internet penetration captures changes in technology.

Local newspaper circulation data, spanning May 2001 to April 2014, exhibits a shallow downward trend until 2007 when the decline in circulation becomes more rapid.

The BBC clicks data series, available from August 2005, covers both clicks on the BBC website and the BBC news app, introduced in July 2010. BBC clicks increased from August 2005 until the introduction of the news app. After an initial fall, BBC clicks continued rising between April 2011 and April 2014.

Due to the constraints of the available BBC data, we are unable to estimate a relationship between the local print newspapers circulation and BBC clicks prior to August 2005. Hence, the regressions presented in the section below study one of two time periods:

- the 'Long' time period regression utilises the full newspaper circulation data set between May 2001 and April 2014; and
- the 'Short' time period regression, as a result of being constrained by the BBC clicks data, utilises the data between August 2005 and April 2014.

Table 35 below demonstrates the high collinearity between variables in our analysis through the use of correlation coefficients between the dependent variables (i.e. local newspaper circulation) and our explanatory variables used throughout the regressions, presented for the period August 2005 to April 2014.

Table 35: Correlation coefficients between variables

Variable	Circulation	Internet penetration	GDP per capita (real)	BBC news clicks
Circulation	1.00			
Internet penetration	-0.98	1.00		
GDP per capita (real)	0.47	-0.43	1.00	
BBC news clicks	-0.88	0.88	-0.22	1.00

Table 35 shows that there is a large and positive correlation between BBC news clicks and Internet penetration of +0.88. This indicates that both variables trend in a similar pattern, in this case upwards, over the time period analysed. Even we ran any regressions, we were aware that the strong correlation between BBC news clicks and Internet penetration meant that it was more than likely that it would be, statistically, difficult to isolate the effect on BBC activity on local newspaper circulation from that of the general growth of the Internet.

Another potential drawback is that we were unable to source website clicks over a long time period at consistent frequencies for other news websites (from publicly available sources and third party data providers). Hence, our work does not control for the impact of other news websites on local newspaper circulation explicitly. Based on reviewing qualitative studies of news website usage in the UK, we consider that news website hits other than the BBC are likely to have increased over time. It is likely, therefore, that the regression analysis risks attributing higher explanatory power to the BBC website hits variable, which might be explained by clicks on other news websites if the data were available.

All of the above means that – without further data that we have been unable to source – caution must be attached to any analysis of the effect of the BBC on local newspaper circulation.

Regression 1: Long period regression with GDP per capita and Internet penetration

Regression 1 assesses the impact of GDP per capita and Internet penetration on local newspaper circulation between May 2001 and April 2014.

The results indicate a statistically significant, positive impact of GDP per capita on local newspaper circulation. In addition, Internet penetration has a statistically significant, negative impact on local newspaper circulation.

The regression fails the Ramsey RESET test at 5 per cent indicating incorrect functional form and potentially omitted variables. The Durbin Watson test is also failed, indicating the presence of positive serial correlation. However, the test statistic is skewed by the irregular frequency of the data series which has been used. A VIF of below 4 indicates low or no multicollinearity.

The specification test results indicate that the model specified in Regression 1 might require alternative functional forms or variants of existing variables (Ramsey RESET and Durbin Watson test statistics). We performed further analysis on this model to consider the statistical significance of, for example, different functional forms of the variables and lagged dependent and explanatory variables. In all cases, different versions of the functional form, and different transformations of the explanatory variables, proved to add no statistical benefit to the regressions run.

However, it is likely that Regression 1 omits a series of variables that might help explain some of the variation of local newspaper circulation for the reasons mentioned in Section 2 and 5 of the report. It is likely that Internet penetration captures some of the impact that these other variables may have on local newspaper circulation, but not all. Based on the available collectable data, it has not been possible to control for all of the other influencing factors that we consider to be potentially relevant in explaining the changes in local newspaper variation over time.

Table 36: Results for Regression 1 with total circulation of local print newspapers as the dependent variable

Variable	Coefficient
GDP per capita (real terms)	3.411***
Penetration of internet	-1.336***
Constant term	-11.93**

Table 37: Diagnostic tests for Regression 1 with total circulation of local print newspapers as the dependent variable

Diagnostic tests	
Number of observations	33
R-squared	0.874
Durbin Watson statistic for Autocorrelation	0.376
Ramsey RESET test for omitted variable bias	7.12e-06
VIF for multicollinearity	1.75

Regression 2: Short period regression with GDP per capita, BBC clicks and Internet penetration

Regression 2 analyses the impact of GDP per capita, Internet penetration and BBC online clicks on local newspaper circulation between August 2005 and April 2014.

The results indicate a non-significant negative impact of GDP per capita on local newspaper circulation, a result which runs counter to what economic intuition would tell us. The results further show a non-significant negative impact of BBC clicks on local newspaper circulation, and a statistically significant, negative impact of Internet penetration on local newspaper circulation.

The regression fails the Ramsey RESET test at 5 per cent indicating incorrect functional form and potentially omitted variables. The Durbin Watson test is also failed, indicating the presence of positive serial correlation. However, the test statistic is skewed by the irregular frequency of the data series which has been used. The VIF has increased to 5.37, indicating medium to high multicollinearity between explanatory variables. Upon further inspection, the Internet penetration and BBC news clicks variables have an 88 per cent correlation.

The challenges with this model, failing diagnostic tests and displaying coefficients which are counter to economic intuition, are likely to be a function of the high correlation between explanatory variables and the limited number of observations in the analysis. Along with a lack of data on other competitors to local newspapers, such as other news websites, it reduces the reliability of the regression results.

Table 38: Results for Regression 2 with total circulation of local print newspapers as the dependent variable

Variable	Coefficient
GDP per capita (real terms)	-0.0705
Penetration of internet	-1.729***
BBC online clicks	-0.0303
Constant term	25.75*

Table 39: Diagnostic tests for Regression 2 with total circulation of local print newspapers as the dependent variable

Diagnostic tests	
Number of observations	19
R-squared	0.915
Durbin Watson statistic for Autocorrelation	0.337
Ramsey RESET test for omitted variable bias	2.71e-06
VIF for multicollinearity	5.37

Econometric analysis of the impact of BBC online news on local newspaper advertising revenues

Outline of approach

In addition to studying newspaper circulation as a measure of the local print newspaper market, we also conducted regressions to assess the effect of the BBC's online news activity on local newspapers' advertising revenues (the combination of print and online advertising revenues).

Our dependent variable is local newspaper print and online advertising revenue on a quarterly basis. These data cover 90 per cent of the local print newspaper market in Great Britain (England, Wales and Scotland) by titles.

We also tested regressions using local newspaper print advertising revenue only. The results from these regressions were in line for those with combined local newspaper print and online advertising revenue (perhaps unsurprising since online advertising represents only a small proportion of local papers' total advertising revenues).

We used BBC News website clicks (excluding World Service) to assess the impact of BBC activity on local newspaper circulation. A negative and statistically significant coefficient on this variable might be consistent with the BBC's activity crowding out local newspapers.

We also tested other explanatory variables to explain macroeconomic and technological factors which may influence consumption of local print newspapers including:

- GDP per capita to capture general macroeconomic trends; and
- Internet penetration to capture changes in technology.

Local newspaper print and online advertising revenue data, spanning 1998 to 2014, is generally increasing in the years to 2005, with the exception of slowdowns and declines in line with the general macroeconomic cycle. After an initial decline between 2005 and 2007, advertising revenues fell significantly between 2007 and 2009. From 2009, advertising revenues continued to decline, although at a slower rate.

The BBC clicks data series, available from August 2005, covers both clicks on the BBC website and the BBC news app, introduced in July 2010. BBC clicks increased from August 2005 until the introduction of the news app. After an initial fall, BBC clicks continued rising between April 2011 and April 2014.

Due to the constraints of the available BBC data, we are unable to estimate a relationship between the local newspaper online and print advertising revenues and BBC clicks prior to August 2005. Hence, the regressions presented in the section below study one of two time periods:

- 'long' time period regressions utilise the full local newspaper advertising revenues data set between 1998 and 2014; and

- 'short' time period regressions, as a result of being constrained by the BBC clicks data, utilise the data between 2005 and 2014

Regression 1: Long period regression with GDP per capita and Internet penetration

Regression 1 assesses the impact of GDP per capita and Internet penetration on local newspaper print and online advertising revenue between 1998 and 2014.

The results indicate a statistically significant, positive impact of GDP per capita on local newspaper print and online advertising revenue. In addition, Internet penetration has a statistically significant, negative impact on local newspaper print and online advertising revenue.

The regression fails the Ramsey RESET test at 5 per cent indicating incorrect functional form and potentially omitted variables. The Durbin Watson test is also failed, indicating the presence of positive serial correlation. A VIF of below 4 indicates low or no multicollinearity.

The specification test results indicate that the model specified in Regression 1 might require additional functional forms or variants of existing variables (Ramsey RESET and Durbin Watson test statistics). We performed further analysis on this model to consider the statistical significance of, for example, different functional forms of the variables and lagged dependent and explanatory variables. In all cases, these different versions of our regressions added no further statistically significant insight.

It is likely that Regression 1 omits a series of variables that might help explain some of the variation of local newspaper circulation for the reasons mentioned in Section 2 and 5 of the report. It is likely that Internet penetration captures some of the impact that these other variables may have on local newspaper circulation, but not all. Based on the available collectable data, it has not been possible to control for all of the other influencing factors that we consider to be potentially relevant in explaining the changes in local newspaper variation over time.

Table 40: Results for Regression 1 with local newspaper print and online advertising revenue as the dependent variable

Variable	Coefficient
GDP per capita (real terms)	3.345**
Penetration of internet	-0.684***
Dummy for Q2	0.0465
Dummy for Q3	0.0105
Dummy for Q4	-0.0269
Constant term	-20.26

Table 41: Diagnostic tests for Regression 1 with local newspaper print and online advertising revenue as the dependent variable⁶²

Diagnostic tests	
Number of observations	65
R-squared	0.348
Durbin Watson statistic for Autocorrelation	0.0440
Ramsey RESET test for omitted variable bias	0
VIF for multicollinearity	3.1

Regression 2: Short period regression with GDP per capita, BBC clicks and Internet penetration

Regression 2 analyses the impact of GDP per capita, Internet penetration and BBC online clicks on local newspaper print and online advertising revenue between 2005 and 2014.

The results indicate a statistically significant positive impact of GDP per capita on local newspaper print and online advertising revenue. It also indicates a statistically significant negative impact of Internet penetration on local newspaper print and online advertising revenue.

The BBC clicks variable has a negative coefficient but is not statistically significant at any recognised significance level. This indicates that there is no evidence, from the data analysed, that BBC activity crowds out advertising revenues in the local newspaper market.

The regression fails the Ramsey RESET test at 5 per cent indicating incorrect functional form and potentially omitted variables. The Durbin Watson test is also failed, indicating the presence of positive serial correlation. A VIF of below 4 indicates low or no multicollinearity.

The challenges with this model, failing diagnostic tests are likely to be a function of the high correlation between explanatory variables and the limited number of observations in the analysis. Along with a lack of data on other competitors to local newspapers, such as other news websites, it reduces the reliability of the regression results.

Table 42: Results for Regression 2 with local newspaper print and online advertising revenue as the dependent variable

Variable	Coefficient
GDP per capita (real terms)	2.837***
Penetration of internet	-2.370***
BBC online clicks	-0.0753
Dummy for Q2	0.0430
Dummy for Q3	-0.0162
Dummy for Q4	-0.0320
Constant term	-7.104

⁶² We have run Regression 1 over the 'Short' time period (i.e. as Regression 2) to understand the extent to which our regression results for Regression 1 change when the time period is truncated. We find that the statistical significance and sign of each variable in Regression 1 over the 'Short' time period is consistent with the statistical significance and sign in Table 40. The R-squared for the 'Short' time period regression is 0.983.

Table 43: Diagnostic tests for Regression 2 with local newspaper print and online advertising revenue as the dependent variable

Diagnostic tests	
Number of observations	35
R-squared	0.984
Durbin Watson statistic for Autocorrelation	0.590
Ramsey RESET test for omitted variable bias	0.000236
VIF for multicollinearity	3.42

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