Department for Education

Your Future | Their Future: impact of the Department for Education's marketing campaign

Annex of results

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This Annex of results provides further detail on the econometric model results as well as the long-term outcome analysis.

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A2 Incremental impact and cost effectiveness on website sessions and registrations

Table 1 Cost effectiveness of channels over time – website sessions

	2012/13		2013/14		2014/15		2015/16 (until 31st January 2016)		Full modelling period	
Marketing channel	**Estimated impact on website sessions**	**Cost per website session**	**Estimated impact on website sessions**	**Cost per website session**	**Estimated impact on website sessions**	**Cost per website session**	**Estimated impact on website sessions**	**Cost per website session**	**Estimated impact on website sessions**	**Cost per website session**
Paid search (£0.95m)	897,860	£0.30	695,730	£0.40	473,110	£0.50	153,810	£1.00	2,220,580	£0.40
Display (£2.01m)	192,400	£3.40	180,990	£2.70	226,490	£2.90	52,330	£4.10	652,210	£3.10
Press (£2.55m)	604,370	£1.90	316,010	£0.70	180,700	£5.30	4,040	£64.20	1,105,120	£2.30
Social media (£0.87m)	16,950	£1.50	100,180	£1.80	123,850	£3.50	91,860	£2.60	332,840	£2.60
Radio (£0.07m)	-	-	-	-	38,080	£1.70	-	-	38,080	£1.70
TV & Video (£4.27m)	34,180	£10.60	-	-	138,840	£10.30	319,580	£7.80	492,600	£8.70
All marketing (£11.95m)	**1,745,760**	**£2.00**	**1,292,910**	**£0.90**	**1,181,080**	**£3.30**	**621,620**	**£5.60**	**4,841,370**	**£2.50**

Source: London Economics' analysis of DfE data

Table 2 Cost effectiveness of channels over time - website registrations, all secondary subjects

	2012/13		2013/14		2014/15		2015/16 (until 31st January 2016)		Full modelling period	
Marketing channel	**Estimated impact on website registrations**	**Cost per website registration**	**Estimated impact on website registrations**	**Cost per website registration**	**Estimated impact on website registrations**	**Cost per website registration**	**Estimated impact on website registrations**	**Cost per website registration**	**Estimated impact on website registrations**	**Cost per website registration**
Display (£2.01m)	2,770	£240	2,890	£170	6,400	£100	3,610	£60	15,670	£130
Press (£2.55m)	4,680	£240	4,470	£50	2,640	£360	950	£270	12,740	£200
Social media (£0.87m)	530	£50	2,260	£80	5,190	£80	9,130	£30	17,110	£50
Digital radio (£0.05m)	-	-	-	-	560	£25	200	£170	750	£62
Email (£0.24m)	380	£280	450	£140	-	-	-	-	830	£290
TV & Video (£4.27m)	-	-	150	-	4,070	£350	11,140	£220	15,370	£280
All marketing (£11.95m)	**8,360**	**£410**	**10,220**	**£120**	**18,860**	**£210**	**25,040**	**£140**	**62,470**	**£190**

Source: London Economics analysis of DfE data

Table 3 Cost effectiveness of channels over time – website registrations, core shortage subjects

	2012/13		2013/14		2014/15		2015/16 (until 31st January 2016)		Full modelling period	
Marketing channel	**Estimated impact on shortage subject registrations**	**Cost per shortage subject registration**	**Estimated impact on shortage subject registrations**	**Cost per shortage subject registration**	**Estimated impact on shortage subject registrations**	**Cost per shortage subject registration**	**Estimated impact on shortage subject registrations**	**Cost per shortage subject registration**	**Estimated impact on shortage subject registrations**	**Cost per shortage subject registration**
Display (£2.01m)	1,590	£410	1,670	£290	3,690	£180	2,080	£100	9,030	£220
Press (£2.55m)	2,660	£420	2,400	£90	1,050	£920	70	£3,580	6,180	£410
Social media (£0.87m)	120	£210	510	£350	1,170	£370	2,060	£120	3,860	£230
Digital radio (£0.05m)	-	-	-	-	360	£38	130	£260	480	£96
Email (£0.24m)	450	£240	530	£120	-	-	-	-	980	£250
TV & Video (£4.27m)	-	-	70	-	1,280	£1,110	2,380	£1,040	3,730	£1,140
All marketing (£11.95m)	**4,820**	**£710**	**5,180**	**£230**	**7,540**	**£510**	**6,720**	**£510**	**24,260**	**£490**

Source: Source: London Economics analysis of DfE data

A3 Impact of marketing on UCAS applications

This section focuses on the impact of marketing activities on UCAS applications. It is presented in the Annex due to the large number of caveats surrounding this model. Relatedly, we recommend that any future spending decisions be made on the basis of the website visits and registrations models rather than the applications model. Despite this, we do still present the findings of the analysis, as well as the associated caveats.

Challenges

The primary challenges associated with measuring the impact of marketing on applications include that the fact that there is strong seasonality in the applications process, as well as the time delay between the marketing activity and the resulting application.

- Seasonality: The applications data series has a high degree of seasonality, in that applications spike as soon as the applications process opens and then experience a decay until the applications process closes. This pattern repeats every year. As the data series was too short (two and a half years of data) to calculate reliable seasonal indices, it was necessary to find an alternative approach to identify and remove the seasonality and isolate the impact of marketing. Two methods were used in order to remove seasonality, which are described in greater detail in subsequent sections.
- Delayed response: There is often a delay between the marketing activity and the resulting application, which presents an additional obstacle when using a time series econometric model. Since this type of modelling relies on being able to capture the relationship between the timing of the activity and the timing of the outcome, lagged marketing variables have been incorporated into the model to allow for some delay in response. However, this can add to the multicollinearity, which in turn makes it more difficult to disentangle effects.
- Change of market design: The process of allocation ITT places to providers changed for the 2015/16 recruitment cycle. As a result, it is possible that applicants had an incentive to apply for ITT places earlier than in other years, which might have changed the seasonal pattern. Therefore, the change in market design poses a further challenge to stripping out the seasonal pattern from marketing and contextual factors' impacts.

We considered two methods of modelling both of the UCAS applications outcome variables. Both methods try to overcome the challenges described above, but adopt a slightly different approach, described in detail in the section below. However, both methods face the same challenges and have strong caveats. As a result, the impact estimates from the website visits and registrations models should be considered more reliable than those of the applications model.

A3.1 All secondary subjects

Method 1: Model with seasonal decay variable

In order to control for the strong seasonality in the applications series, a seasonality variable was artificially created to mimic the peak in applications observed at the beginning of each applications cycle and the subsequent decay until the cycle closed.

Approach to identifying seasonality

A number of variables with different rates of decay starting from the week of the peak of UCAS applications onwards were generated and tested in the absence of a marketing variable in the model. The decay variable that best fit the shape of the UCAS applications outcome variable was chosen as the 'seasonality' variable[1]. Once we accounted for the seasonal pattern, we tested and added to the model marketing variables[2], following the same methodological procedure as described in the Technical Annex, to capture any additional movement in applications that might be due to marketing.

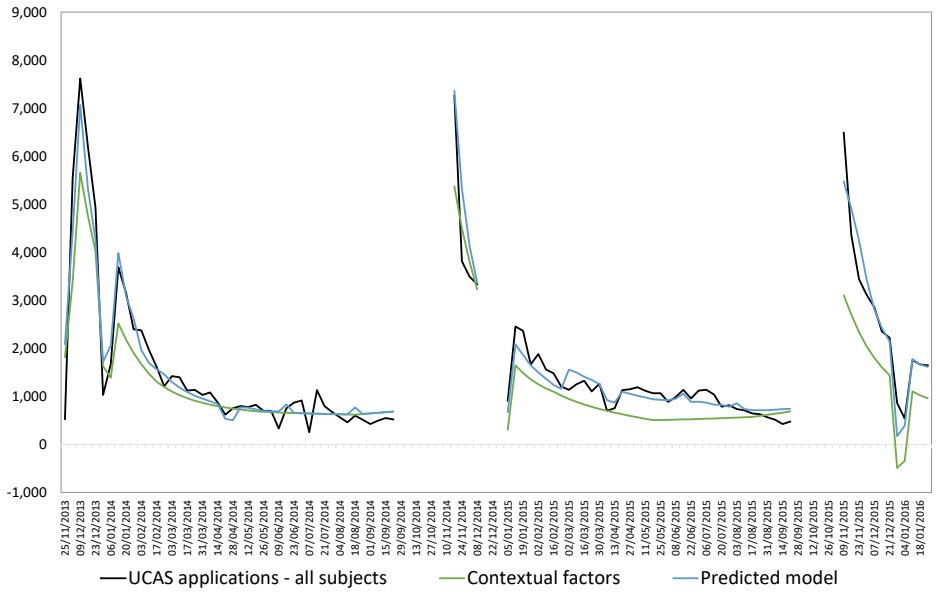
The main caveat of this model is that the seasonality pattern is constructed artificially from the data which may have the result that the impact of marketing activities is overstated (or understated). Additionally, it does not attempt to capture the change in market design.

Results

The analysis which includes this seasonal decay variable is represented visually in Figure 1 below. This graph shows the proportion of total applications for secondary subjects estimated to be attributable to marketing activities and the proportion estimated to be attributable to contextual factors (in this model, the contextual factors consist of the 'seasonality' variable and unemployment measures).

[1] The goodness of fit was judged based on a combination of correlation analysis and graphic examination.
[2] Marketing variables were added to the model if they had a positive sign and realistic size of estimated coefficient.

Figure 1: Estimated impact of marketing and contextual factors on UCAS applications (Method 1)

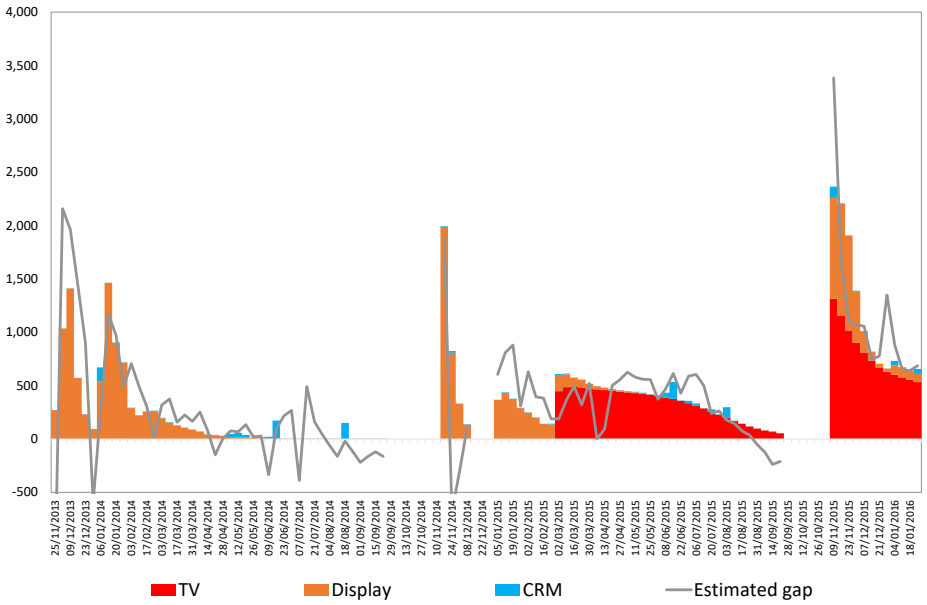


Sample size = 98; R-squared = 0.93
Note: Gaps in series in autumn 2014 are due to data loss caused by technical issues at the source; Annual gaps in the series between September and October reflect the period when applications are closed.
Source: London Economics' analysis of DfE data

The R-squared value of the model is extremely high at 93%. This is in part due to the fact that the seasonal decay variable has been constructed based on the patterns actually observed in the applications data series. As a result, the estimated number of applications attributable to contextual factors (in this case, seasonality and unemployment and illustrated by the **green line**), account for nearly 80% of the variation in UCAS applications**.** Thus, little of the remaining variation is explained by marketing activities.

Figure 2 presents the estimated impact of the marketing activities on UCAS applications. The total number of additional UCAS applications attributed to *Your Future* | *Their Future* marketing activities over the modelling period, using this method of estimation, stands at approximately 39,890. CRM activities together with TV and Display were identified to have a significant positive impact in this model.

Figure 2: Incremental impact of marketing activities on UCAS applications (Method 1)



Source: London Economics' analysis of DfE data

We observe that marketing variables captured by this model exhibit a longer-lasting impact on UCAS applications than they do for other modelled outcomes. Additionally, the impact of marketing activities appears to vary with the position in the applications cycle[3].

Cost effectiveness by channel

Table 4 presents a measure of cost effectiveness by channel, calculated as the cost of marketing activities divided by the estimated number of UCAS applications for all secondary subjects attributable to those marketing activities. Assuming again that the entire cost by marketing channel is allocated to UCAS applications for all secondary subjects, the average cost of achieving a UCAS application over the entire modelling period is estimated at approximately £200[4]. The costs per additional UCAS application associated with TV & Video marketing activity[5] and Display activity were estimated to be approximately £220 and £70, respectively.

[3] This effect was identified by testing interaction terms between marketing variables and the seasonal pattern variable, some of which had positive and statistically significant coefficients.
[4] Based on the entire marketing campaign with the exception of CRM activities
[5] Although only TV entered the model, it is difficult to disentangle entirely the impact from TV and Video, so the cost effectiveness figure is based on a combined cost of the two channels.

Table 4 Cost effectiveness of channels over time – UCAS applications, all secondary subjects

	2013/14		2014/15		2015/16 (until 31st January 2016)		Full modelling period	
Marketing channel	**Estimated impact on UCAS application**	**Cost per UCAS application**	**Estimated impact on UCAS application**	**Cost per UCAS application**	**Estimated impact on UCAS application**	**Cost per UCAS application**	**Estimated impact on UCAS application**	**Cost per UCAS application**
CRM (no cost data)	620		480		210		1,310	
Display (£2.01m)	9,200	£60	6,040	£90	4,060	£40	19,300	£70
TV & Video (£4.27m)	-	-	9,780	£150	9,510	£260	19,280	£220
All marketing (£11.95m)	**9,820**	**£340**	**16,300**	**£200**	**13,780**	**£110**	**39,890**	**£200**

Note: Figures are rounded to the nearest ten
Source: London Economics analysis of DfE data

Method 2: Model with 'allocations' variable

The change in the design for the allocation of ITT places to providers in 2016/17[6] revealed that this change might have led to early closures of applications for certain subjects. Therefore, individuals might not have been able to apply for an ITT place even if they wished to do so, and so the change in market design would have indirectly impacted the outcome variable, as well as the impact that marketing activities could potentially have.

Approach to identifying seasonality

Since the change in market design is not directly quantifiable, we attempted to construct a proxy variable for seasonality, which represents the number of UCAS ITT places still available during the applications cycle[7]. The objective in including this variable was to indirectly incorporate any effect the market design changes might have had on applications.

In addition, this variable demonstrated a seasonal pattern that was similar to the one previously observed in the applications data series. As such, it was hoped that this variable could be used to control for the seasonal trends in applications, as well as any

[6] For more details on the changes in the ITT allocation mechanism, see Roberts, N. and Foster, D. (2016) 'Initial teacher training in England', Briefing paper No. 6710. Available at http://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN06710#fullreport

[7] Number of places still available = Total number of ITT places – Number of acceptances for ITT places made; a variable using the 'number of offers for ITT places made' was also considered, but it did not describe the seasonal pattern as well.

changes in the seasonal pattern resulting from the change in the mechanism for allocation ITT places.

Results and further caveats

The analysis based on this 'allocations' variable is shown in Figure 3. This graph decomposes total applications into those estimated to be attributable to marketing and those estimated to be attributable to contextual factors (in this case – 'seasonality' only).

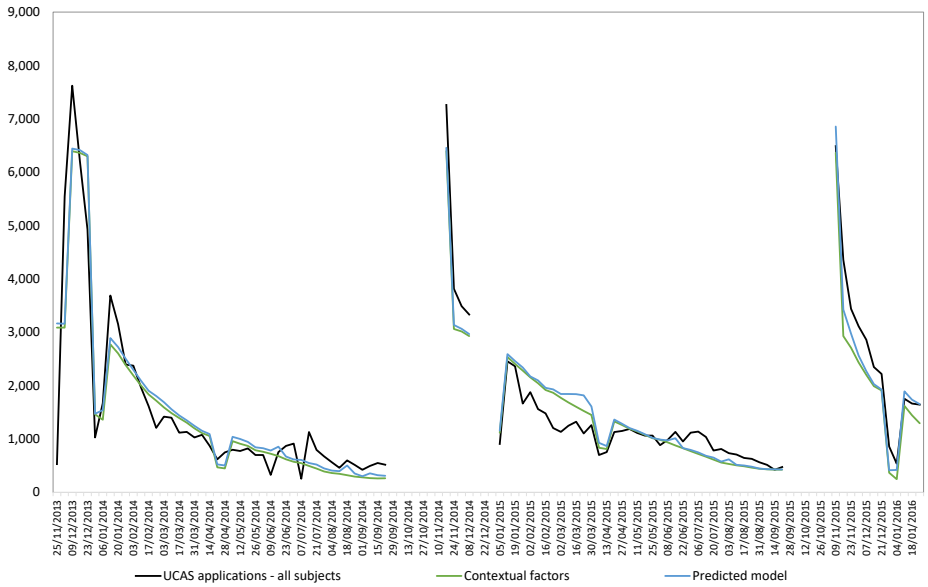
The applications attributable to contextual factors and seasonality alone exceed the estimated number of applications for some parts of the series. This leaves a 'negative' gap between the estimated number of applications and the number of applications that are attributable to contextual factors and seasonality, as shown in Figure 4. Therefore, very little variation is left to be explained by marketing activities, which leads to concerns that the seasonal pattern **over-estimates** the number of applications driven by seasonality.

In addition to the previously mentioned caveats, there is a strong concern about endogeneity[8] of this seasonality variable. By construction, the number of applications up to a given week will determine how many ITT places are still available in the same given week. Therefore, seasonality as an explanatory variable is partially driven by the outcome variable itself. In turn, this seasonality variable is likely to be dependent on the marketing activities undertaken, to the extent to which they impact outcomes. The endogeneity issue leads to a concern that the estimates of the impacts from marketing are biased and therefore not sufficiently reliable.

There is a further concern that though this curve fits the data well, applicants are not aware of how quickly places fill up, and this factor itself does not drive their actions (until applications actually close).

[8] Endogeneity occurs in an econometric model when problem occurs when an explanatory variable (in this case, the proxy for seasonality) is correlated with the error term. Endogeneity is a concern in this case since seasonality drives applications, but also applications are used to construct the seasonality proxy variable, which represents the number of remaining ITT places. This issue is likely to lead to unreliable estimated coefficients in the model.

Figure 3: Estimated impact of marketing and contextual factors on UCAS applications (Method 2)

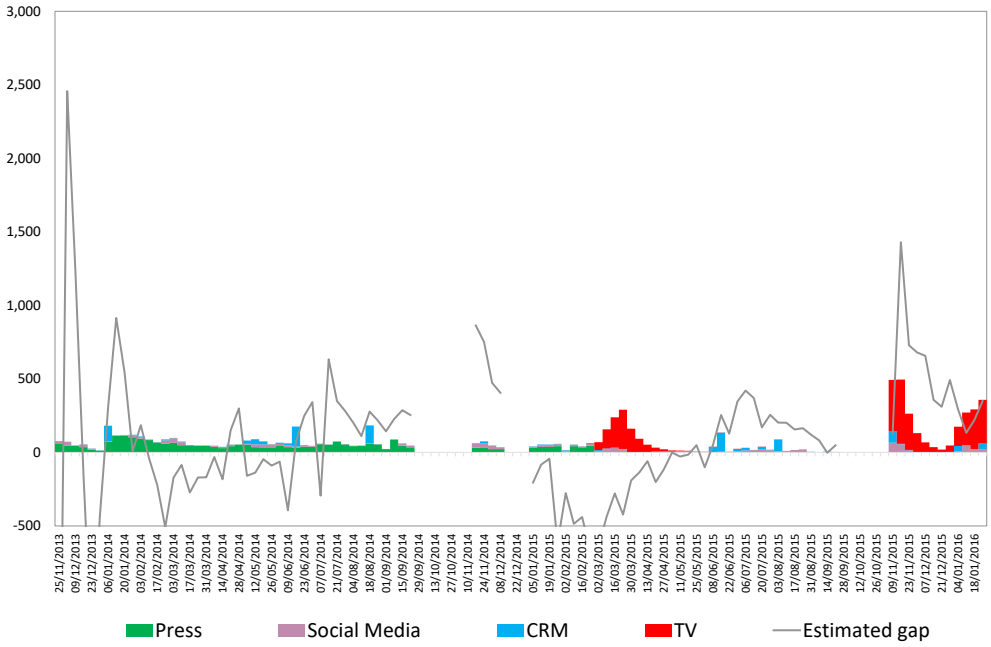


Sample size = 98; R-squared = 0.86

Note: Gaps in series in autumn 2014 are due to data loss caused by technical issues at the source; Annual gaps in the series between September and October reflect the period when applications are closed.

Source: London Economics' analysis of DfE data

Figure 4: Incremental impact of marketing activities on UCAS applications (Method 2)



Source: London Economics' analysis of DfE data

Given the many caveats associated with this model[9] it is not best suited for identifying the impact of marketing activities. For this reason, cost effectiveness estimates of the marketing campaign would be even more unreliable compared to those presented in Method 1, and thus are not presented for this method.

A3.2 Core shortage subjects

Method 1: Model with seasonal decay variable

A decay variable was also included in the model which assessed the impact of marketing on UCAS applications for shortage subjects. The generation and selection process of this variable followed the same process described under Method 1 within section A1.1.

Figure 5 shows the proportion of applications for shortage subjects estimated to be attributable to marketing activities, and the proportion estimated to be attributable to contextual factors (which in this model include unemployment and 'seasonality').

The seasonal pattern of UCAS applications for shortage subjects appears to decay more gradually compared to that of UCAS applications for all subjects. This could be due to:

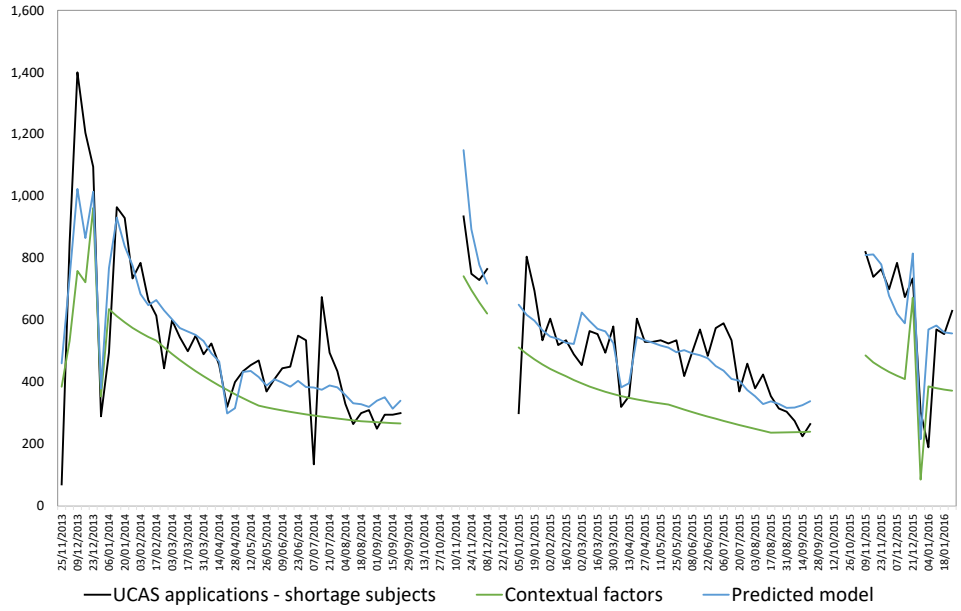
a) different behaviour of shortage subject applicants over the academic year (i.e. with greater outside options in the labour market, they do not rush to apply); and/or

b) marketing has a stronger long-lasting impact on applicants for shortage subject ITTs.

It can also be noted that the estimated gap between the contribution of contextual factors and the predicted outcome is larger during the 2014/15 cycle compared to 2013/14 cycle. This may imply that marketing activities account for a larger share of applications for shortage subjects in the 2014/2015 cycle relative to the 2013/14 cycle.

[9] The primary caveat compared to Method 1 is the negative gap left to be explained by marketing after the proxy variable for seasonality is included.

Figure 5: Estimated impact of marketing and contextual factors on UCAS core shortage subject applications (Method 1)

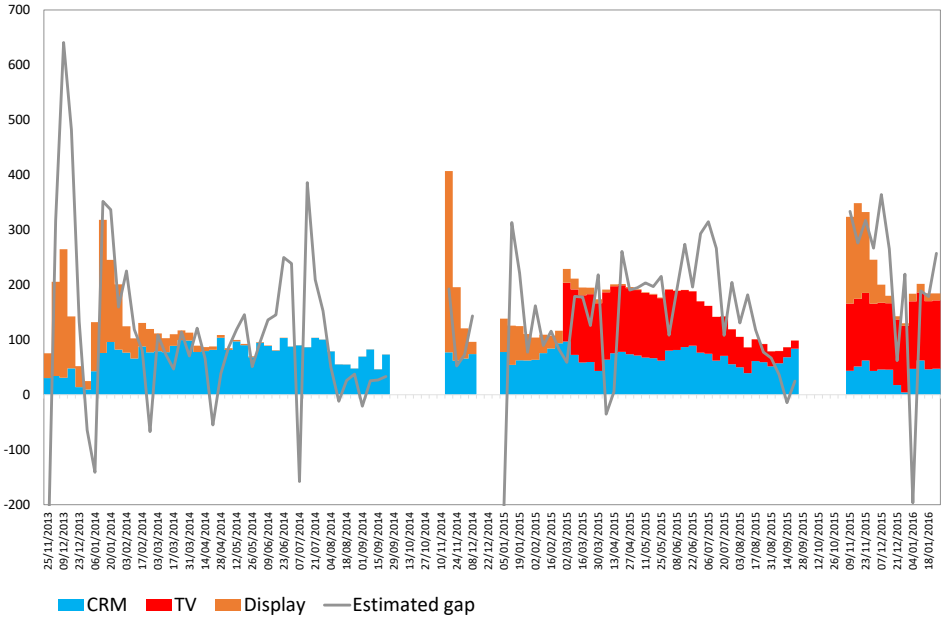


Sample size = 98; R-squared = 0.67

Note: Gaps in series in autumn 2014 are due to data loss caused by technical issues at the source; Annual gaps in the series between September and October reflect the period when applications are closed.

Source: London Economics' analysis of DfE data

Figure 6: Incremental impact of marketing activities on UCAS core shortage subject applications (Method 1)



Source: London Economics' analysis of DfE data

The total number of additional UCAS applications for core shortage subjects resulting from marketing activity was estimated to be approximately 13,940. As in the 'all subjects'

applications model, CRM activities together with TV and Display were assessed to have the greatest positive impact.

We also observe that marketing variables captured by this model exhibit a longer-lasting impact on UCAS applications than they did for other modelled outcomes. Additionally, the impact of marketing activities appears to vary with the position in the applications cycle[10].

Cost effectiveness by channel

Table 5 illustrates the estimated cost effectiveness by marketing channel, calculated as the cost of marketing activities divided by the estimated number of UCAS applications within core shortage subjects resulting from those marketing activities. Assuming again that the entire cost by marketing channel is allocated to UCAS applications for core shortage subjects, the average cost of achieving an additional shortage subject UCAS application over the entire modelling period was estimated at approximately £580 (based on the cost of the entire marketing campaign (except for CRM activities for which no costs were available)). The costs per additional UCAS application for TV & Video[11] and Display were estimated at approximately £1,040 and £400, respectively.

Table 5 Cost effectiveness of channels over time – UCAS applications, core shortage subjects

	2013/14		2014/15		2015/16 (until 31st January 2016)		Full modelling period	
Marketing channel	**Estimated impact on core shortage subject UCAS application**	**Cost per core shortage subject UCAS application**	**Estimated impact on core shortage subject UCAS application**	**Cost per core shortage subject UCAS application**	**Estimated impact on core shortage subject UCAS application**	**Cost per core shortage subject UCAS application**	**Estimated impact on core shortage subject UCAS application**	**Cost per core shortage subject UCAS application**
CRM (no cost data)	3,240		2,900		520		6,660	
Display (£2.01m)	1,520	£360	1,000	£570	670	£270	3,200	£400
TV & Video (£4.27m)	-	-	2,620	£540	1,470	1,690	4,090	1,040
All marketing (£11.95m)	**4,760**	**£710**	**6,520**	**£500**	**2,660**	**£550**	**13,940**	**£580**

Note: Figures are rounded to the nearest ten
Source: London Economics analysis of DfE data

[10] This effect was identified by testing interaction terms between marketing variables and the seasonal pattern variable, some of which had positive and statistically significant coefficients.
[11] Although only TV entered the model, it is difficult to disentangle entirely the impact from TV and Video, so the cost effectiveness figure is based on a combined cost of the two channels.

Cost distribution between *shortage* and *non-shortage* subject UCAS applications

Although these cost effectiveness figures appear high, it has to be re-iterated that the full cost of the marketing campaign has been distributed over shortage subject UCAS applications only. As such, it has to be considered an overestimate – since we know that other non-shortage applications were also driven by the same expenditure. This is the most significant caveat associated with the figure.

However, we can combine the models for core shortage subjects and for all secondary subjects to consider some different scenarios for what proportion of the total cost can be attributed to encouraging core shortage applications. The 'all secondary subjects' model suggests that 39,885 applications can be attributed to marketing activities and the shortage subjects model suggests that 13,940 of these are applications for shortage subjects (leaving 25,945 application for non-shortage subjects).

Table 8 below shows that if 50% of the total marketing spend is aimed at generating shortage subject applications, then the relevant cost per shortage subject application is £292, rather than the £583 figure which applies if all marketing activities were aimed at generating short subject applications.

Table 6 Cost distribution between *shortage* and *non-shortage* subject UCAS applications

Marketing channel	**Shortage subjects**	**Non-shortage subjects**
# applications	13,940	25,945
% of marketing spend aimed at shortage subject applications	**Cost per incremental application**	
100%	£583	-
90%	£525	£31
80%	£467	£63
70%	£408	£94
60%	£350	£125
50%	£292	£157
40%	£233	£188
30%	£175	£219
20%	£117	£251
10%	£58	£282
0%	-	£313

Source: London Economics analysis of results

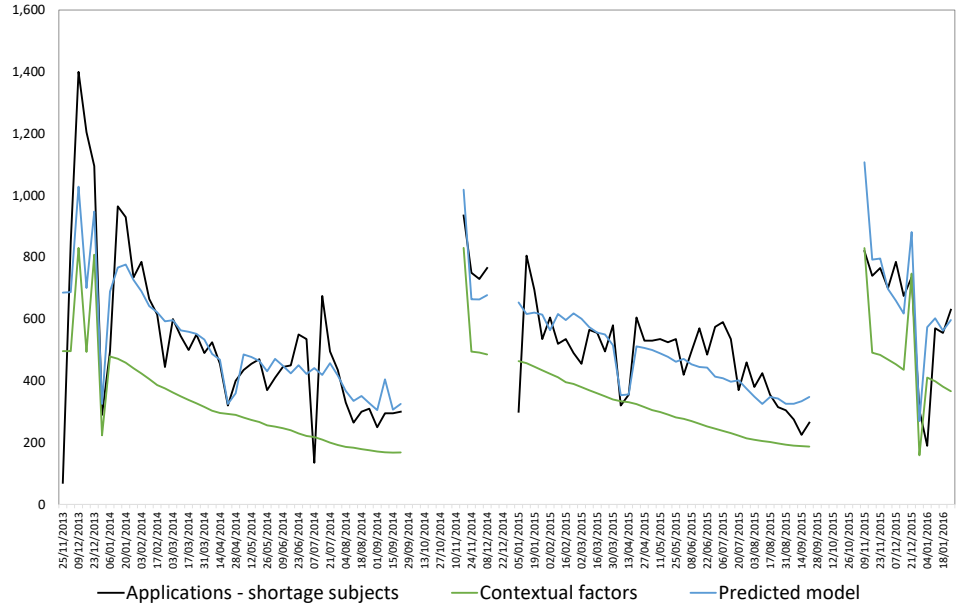
As with ‘all secondary subjects’, the ‘core shortage subjects’ model using a seasonal decay variable also suggests that marketing had some impact on UCAS applications. However, given the number of caveats involved in the modelling, the estimates of the effectiveness of marketing activities need to be treated with caution and similar caveats as for the ‘all secondary subjects’ model apply:

- The cost effectiveness figure does not include the cost of CRM since cost information was not available.
- The core shortage applications data series has a high degree of seasonality, which we have attempted to capture using an artificially-created decay variable. Since this variable has been built based on the observed levels of applications, it could capture some impact of the marketing activities, in which case the additional impact from marketing activities presented would be understated and the cost effectiveness figure would be an overestimate.

Method 2: Model with allocations variable

The alternative ‘allocations’ variable constructed from data on the number of UCAS ITT places still available was also tested for the shortage subject applications model, following the same process as for ‘all secondary subjects’ applications described under Method 2 in section A1.1. The results of the analysis based on this allocations variable are shown below.

Figure 7: Estimated impact of marketing and contextual factors on UCAS core shortage subject applications (Method 2)

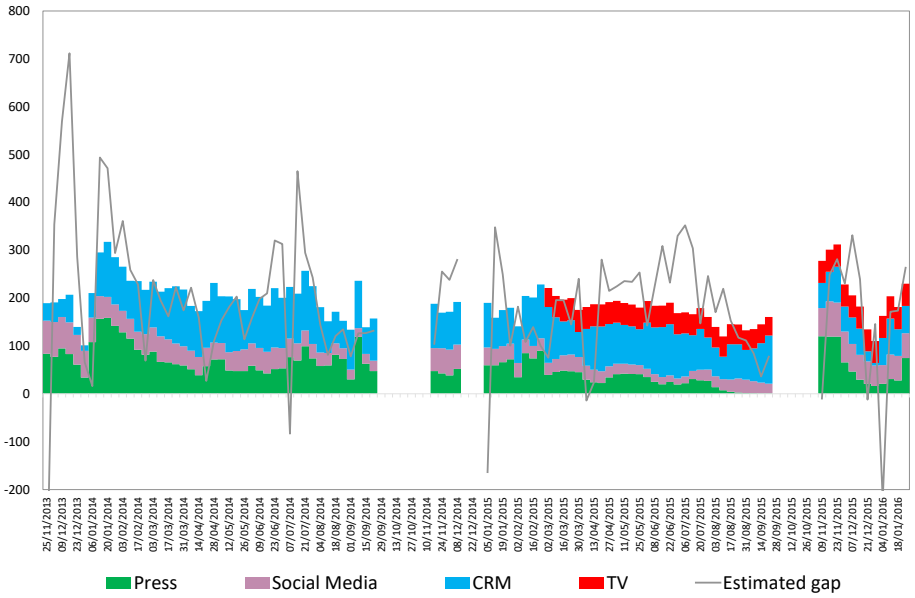


Sample size = 98; R-squared = 0.55

Note: Gaps in series in autumn 2014 are due to data loss caused by technical issues at the source; Annual gaps in the series between September and October reflect the period when applications are closed.

Source: London Economics’ analysis of DfE data

Figure 8: Incremental impact of marketing activities on UCAS core shortage subject applications (Method 2)



Source: London Economics' analysis of DfE data

This 'shortage subjects' application model suffers from the same shortcomings as the previous application models discussed. While this shortage subjects application model does not have the same issue as the 'all secondary subjects' application model under Method 2, in the sense that the estimated impact of contextual factors exceeds the estimated applications in some places, many of the same caveats apply, specifically:

- As with the model for applications in all subjects, there is a strong concern about endogeneity of the seasonality variable.
- There is a further concern that though this curve fits the data well, intuitively, applicants in shortage subjects are unlikely to be heavily impacted by courses filling up. This would imply that some of the variation in shortage subject applications which in reality is due to marketing activities might have been misattributed to seasonality.

For these reasons, cost effectiveness estimates of the marketing campaign would be even more unreliable compared to those presented in Method 1, and thus are not presented.

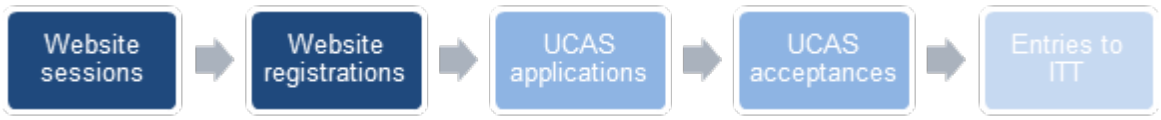
A4 Impact of marketing on long-term outcomes

The ultimate purpose of the *Your Future | Their Future* marketing campaign is to assist the DfE in achieving their target numbers of Initial Teacher Trainees set by the Teacher Supply Model.

Each outcome that has so far been modelled in this study – website sessions and website registrations – is an intermediate outcome leading up to the final outcome

according to the campaign – ITT entries. The intermediate outcomes modelled so far are followed by a number of further quantifiable outcomes along the customer journey:

Figure 9: Outcomes along the customer journey



UCAS applications, as the next outcome following website registrations, has been modelled econometrically following an approach similar to that of modelling its preceding outcomes. However, there are a number of challenges and caveats associated with this approach, as already elaborated in section A1 is considered insufficiently reliable.

Furthermore, despite the availability of weekly data on UCAS acceptances[12], the challenges of this variable would be similar to those of UCAS applications and exacerbated by the fact that an UCAS acceptance can take place months after the individual was exposed to the marketing activity that encouraged them to pursue a career in teaching in the first place (meaning that the link between the timing of the marketing activity and the timing of the response is weak and therefore difficult to identify using time-series data). Entries to ITT, on the other hand, are observed once per academic year. Therefore, this outcome is unsuitable for econometric modelling with only three years of entries to ITT data overlapping with available marketing data. (The ITT census has been published for the last four years).

Nevertheless, an indication of the impact of marketing on these long-term outcomes - UCAS applications, UCAS acceptances and entries to ITT - would be helpful to understand what would have happened in the absence of marketing. However, currently there is no available data which allows us to examine the link and time delay between these longer terms outcomes and the intermediate outcomes modelled. For this reason, we have produced estimates of the impact from marketing on these long-term outcomes, using the latest intermediate outcome modelled along the customer journey – website registrations.

To do this, a strong assumption was required: that the proportion of each additional long-term outcome attributed to the *Your Future | Their Future* marketing campaign is equal to that of website registrations. Essentially this means that we assume marketing has an equally strong impact (in percentage terms) on UCAS applications, UCAS acceptances

[12] UCAS acceptances refers to the number of offers made by providers which have been accepted by applicants.

and entries to ITT, as on website registrations.The proportions of long-term outcomes attributed to marketing activities, for each recruitment cycle, are assumed to be the same as the proportion of website registrations the relevant model has attributed to marketing[13]. These proportions are presented in the table below:

Table 7: Proportion of long-term outcomes attributed to marketing

Subjects included in outcome	2012/13	2013/14	2014/15	2015/16 (until 31st January 2016)
All secondary subjects	25%	29%	43%	72%
Core shortage subjects	27%	23%	34%	54%

Note: Based on the relevant website sessions models. Proportions are derived as the 'estimated number of marketing attributed to website registrations' / 'estimated number of website registrations', to account for the goodness of fit of the model.
Source: London Economics

Applying the relevant proportion to each long-term outcome, the predicted contributions from marketing activities to each long-term outcome, in each observed recruitment cycle, are presented in Table 8.

[13] For example, the 'website registration – all subjects' model estimates that in the 2013/14 academic year, around 10,220 registrations, i.e. 29% of the website registions in that cycle, occurred due to marketing activities. We assume that the same proportion of UCAS applications in that year took place due to marketing, which would be around 19,300 out of nearly 67,000 UCAS applications (all secondary subjects) in 2013/14.

Table 8: Predicted contribution of *Your Future* | *Their Future* to long-term outcomes

Long-term outcome	Subjects included in outcome	2013/14	2014/15	2015/16 (until 31st January 2016)	Assumptions
UCAS applications	**All secondary subjects**	19,300	25,440	22,520	Share of UCAS applications (acceptances) driven by marketing in all UCAS applications (acceptances)$_t$ = Share of website registrations driven by marketing in all website registrations$_t$
	Core shortage subjects	5,320	7,270	4,030	
UCAS acceptances	**All secondary subjects**	3,810	5,970	4,450	
	Core shortage subjects	1,200	1,890	680	
ITT entries[14]	**All secondary subjects**	3,230	3,740	6,490	Share of UCAS applications (acceptances) driven by marketing in all UCAS applications (acceptances)$_t$ = Share of website registrations driven by marketing in all website registrations$_{t-1}$[15]
	Shortage subjects[16]	1,940	1,660	2,800	

Note: 2013/14 is the first available year of data on applications and acceptances.
Source: London Economics analysis and Department for Education (2016) data on Initial teacher training new postgraduate entrants by subject and target (detailed breakdown)

Combining information on the total number of UCAS applications with the predicted contribution of marketing on UCAS application (indirectly through website registrations), the analysis suggests that approximately 67,260 applications were as a consequence of the *Your Future* | *Their Future* campaign. Using the direct estimate of marketing on UCAS applications (i.e. Method 1), the contribution stands at 39,890.

The predicted numbers presented in this section are based on a strict assumption that marketing activities are as successful at driving long-term outcomes, as they are driving intermediate outcomes. This is a very strong assumption, but nevertheless it provides an indication of how the impact of marketing on long-term outcomes might have varied over

[14] ITT entry figures in 2015/16 include the Teach First route.
[15] Since ITT entries occur at the beginning of the academic year following recruitment cycle, the multiplier for ITT entries in year *t* is the proportion of website registrations attributed to marketing from year *t-1.*
[16] For ITT entries, all shortage subjects (Mathematics, total Science, Computer Science, Design & Technology and Modern and ancient languages) were considered in every year, as the required break-down is not available for every year.

the observed academic cycles. To robustly estimate the impact of marketing on long-term outcomes, further data is required, potentially at an individual level.

A5 Model results

Figure 10: Website sessions

Variable	Coefficient	Std. Error	t	P>|t|
Grad unemp 21-30yrs (lag 2, smooth)	224,987.4	133,207.8	1.69	0.093
Public sector pay (smooth)	-346.1	154.8	-2.24	0.027
Teacher Salary under-25s (MA)	14.4	6.9	2.08	0.039
Seasonality variable	1,201.1	266.6	4.50	0.000
Dummy for Bank Holidays	-6,816.4	1,407.6	-4.84	0.000
Dummy for Christmas	-1,2157.1	2,422.2	-5.02	0.000
Dummy wk 23rd March 2015	-62,653.2	7,468.4	-8.39	0.000
TVRs (Dec90 ATAN300)	84,319.9	82,840.5	1.02	0.310
TV (branded search website sessions)	4.6	1.3	3.63	0.000
Search (Dec75)	1.4	.2451	5.86	0.000
Social Media	.0738	.035	2.13	0.035
Display	.0005	.0002	3.14	0.002
Radio (Dec50)	.0003	.0002	1.88	0.063
Press (branded search website sessions)	3.9	1.36	2.85	0.005
Press (URLs)	.8992	.735	1.22	0.223
Video	.2515	.229	1.10	0.274
Constant	-157,842.2	181,478.4	-0.87	0.386

Source: London Economics analysis of DfE data

Figure 11: Website registrations - all secondary subjects

Variable	Coefficient	Std. Error	t	P>|t|
Seasonality	15.3	9.2	1.7	0.097
Website Switchover	91.7	102.6	0.9	0.373
Dummy January 2015	635.9	286.3	2.2	0.028
Dummy February 2015	163.2	250.6	0.7	0.516
Christmas dummy	-294.2	118.8	- 2.5	0.014
TV (branded search clicks)	0.1	.03	4.5	0.000
Display	0.6	.26	2.4	0.019
Social Media	0.7	.11	6.6	0.000
Video	38.3	20.3	1.9	0.061
Email	0.5	.2	3.0	0.003
Radio	14.0	9.0	1.6	0.123
Press (after website switchover)	0.2	.14	1.5	0.133
TV (after website switchover)	0.1	.05	1.1	0.271
Press	0.0	.00	1.8	0.071
Constant	-72.1	334.6	- 0.2	0.830

Source: London Economics analysis of DfE data

Figure 12: Website registrations - core shortage subjects

Variable	Coefficient	Std. Error	t	P>|t|
Scholarships	0.006	0.0026	2.3	0.022
Grad unemp 21-30yrs (lag 2, smooth)	5,203.1	2,394.8	2.2	0.031
Seasonality	12.2	4.5	2.7	0.007
TV (branded search clicks)	0.04	0.013	3.0	0.003
Specialist press circulation	.000012	.00005	0.2	0.820
Specialist press	.000125	.00007	1.9	0.062
Email	0.54	0.2	3.2	0.002
Display	0.36	0.1	3.1	0.002
Social Media	0.16	0.0	3.6	0.000
Radio	8.96	5.1	1.8	0.079
You Tube	17.6	10.8	1.6	0.106
Constant	-568.6	278.2	-2.0	0.043

Source: London Economics analysis of DfE data

Figure 13: UCAS applications - all secondary subjects (Method 1)

Variable	Coefficient	Std. Error	t	P>|t|
Seasonality (UCAS open Dec10 ATAN50)	2,424,455	184513	13.14	0.000
Christmas dummy (lag 1)	-1796.4	308.7631	-5.82	0.000
Christmas dummy (lag 2)	-1538.8	250.4848	-6.14	0.000
Easter dummy (lag 1)	-273.8	208.0384	-1.32	0.192
Grad unemp 21-30yrs (lag 1, smooth)	17198.9	7602.955	2.26	0.026
Display * Seasonality	.059	.0122119	4.83	0.000
CRM (# SMS sent)	.002	.0032163	0.77	0.446
TVRs (Dec10 ATAN50)	448.95	126.7036	3.54	0.001
TV * Seasonality	963428.4	368383.5	2.62	0.010
Constant	-189.8	393.6557	-0.48	0.631

Source: London Economics analysis of DfE data

Figure 14: UCAS applications - core shortage subjects (Method 1)

Variable	Coefficient	Std. Error	t	P>|t|
Seasonality (UCAS open Dec5ATAN300)	7235565	1499986	4.82	0.000
Christmas dummy	271.908	105.1804	2.59	0.011
Christmas dummy (lag 1)	-307.2721	108.8925	-2.82	0.006
Easter dummy	-9.444714	75.33595	-0.13	0.901
Easter dummy (lag 1)	-154.0183	75.52306	-2.04	0.044
Grad unemp 21-30yrs (lag 2, smooth)	3618.494	1338.052	2.70	0.008
Display * Seasonality	.0097751	.0035933	2.72	0.008
CRM (# outbound calls)	.0542306	.0455698	1.19	0.237
TVRs (Dec10 ATAN50)	125.2043	33.89816	3.69	0.000
Constant	85.83606	91.25132	0.94	0.349

Source: London Economics analysis of DfE data

Figure 15: UCAS applications - all secondary subjects (Method 2)

Variable	Coefficient	Std. Error	t	P>|t|
Seasonality (open dummy)	3,312.9	290.9	11.4	0.000
Seasonality (remain offers coreshort scl)	3,118.5	251.6	12.4	0.000
Christmas dummy (lag 1)	- 1,457.9	417.6	- 3.5	0.001
Christmas dummy (lag 2)	-1,496.1	355.9	- 4.2	0.000
Easter dummy (lag 1)	-568.9	288.2	- 2.0	0.052
Press (branded search clicks)	0.0	0.1	0.5	0.650
CRM (# SMS sent)	0.0	0.0	0.5	0.654
TV * Seasonality	1,246.1	1,148.4	1.1	0.281
Social Media	0.0	0.0	0.2	0.879
Constant	- 30.1	129.2	-0.2	0.817

Source: London Economics analysis of DfE data

Figure 16: UCAS applications - core shortage subjects (Method 2)

Variable	Coefficient	Std. Error	t	P>|t|
Seasonality (open dummy)	335.0	92.8	3.6	0.001
Seasonality (remain offers coreshort scl)	405.0	88.4	4.6	0.000
Christmas dummy	319.7	117.4	2.7	0.008
Christmas dummy (lag)	-259.8	122.5	- 2.1	0.037
Easter dummy (lag)	-161.9	76.3	-2.1	0.037
Press (branded search clicks)	0.055	0.0	1.5	0.142
CRM (# outbound calls)	0.065	0.1	1.2	0.239
TVRs (Dec5 ATAN50)	46.7	63.3	0.7	0.463
Specialist press circulation (Dec50)	.000082	.000081	1.0	0.314
Facebook (Dec10)	2.11e-06	3.33e-06	0.6	0.529
Constant	91.0	111.8	0.8	0.418

Source: London Economics analysis of DfE data

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