Appendix M: Quantitative analysis of crematoria entry

Introduction

1.   We have conducted a Performance Concentration Analysis (PCA) to test how crematoria volumes and fees respond to the entry of another crematorium within their local area. In doing so, we estimate the effect of entry on an incumbent crematorium's volume and standard cremation fee, and assess whether these effects differ between local authority and private crematoria.

2.   This appendix describes the data, sets out the methodology used and its strengths and limitations, reports the results, summarises parties' comments on this analysis and covers extensions of the main analysis.

Data

Volume and fee data

3.   We based our analysis on the following data for each year from 2007[1] to 2018 from:

   (a) the Cremation Society's annual survey of crematoria which provides each crematorium's volume and standard cremation fee (referred to as 'fee' throughout this appendix); and,

   (b) the Institute of Cemetery and Crematorium Management (ICCM) which provides the year of each crematorium's entry, operator and postcode.

Drive time data

4.   We used the postcode data to estimate the drive times at normal speed between crematoria within 60 minutes of each other. This data is then used to calculate the number of alternative crematoria for each crematorium in each year within the following normal drive time bands: 0-10, 10-20, 20-30 and 30+ minutes. The equivalent cortege drive time bands are 0-17, 17-33, 33-50 and 50+ minutes.[2]

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[1] Using data from 2007 enables the estimation of the effect of entry from 2008 onwards.
[2] In this appendix we provide results in both normal and cortege drive times. In instances where we have interpreted our entry analysis alongside other sources of evidence that are presented in cortege drive times (for example, in order to assess the delineation of the geographic market for the provision of crematoria services) we have assessed sources of evidence on a comparable basis (ie in cortege drive times).

Number of entries

5.　Table 1 shows the number of entries experienced by incumbents during the time period covered by the data set, split by drive time band and type of incumbent (local authority or private crematorium). A crematorium may enter in a location which is within drive time bands of multiple incumbent crematoria, particularly for drive time bands which are further away. For example, incumbent crematoria experienced 78 entries within a 20-30 minute normal drive time (a 33-50 minute cortege drive time) during the relevant period, 48 of which were entries experienced by local authority crematoria, and 30 of which were experienced by private crematoria.

6.　The representativeness and the reliability of the estimated impacts depend on the number of observations the estimates are based on; the higher the number of incumbents experiencing entry, the more robust our results are likely to be. We note that there are a reasonable number of entries across most drive time bands and both incumbent types over the period considered. However, only two crematoria (both local authority crematoria) experienced entry within the 0-10 minute normal drive time (0-17 cortege drive time) band and only seven private crematoria experienced entry within the 10-20 minute normal drive time (17-33 cortege drive time) band. The small number of observations in these drive time bands is likely to affect the robustness of the corresponding results (noted with a "†" in our results tables).

Table 1: Number of entries experienced by incumbent type within each drive time band, 2008 – 2018

Drive time band (normal, min)	Drive time band (cortege, min)	Incumbent Type		
		All	Local authority	Private
0-10	0-17	2	2	0
10-20	17-33	35	28	7
20-30	33-50	78	48	30
30+	50+	549	366	183

Source: CMA analysis.

7.　We note the following two remarks in relation to the data used in this analysis:

(a) First, there are no exits in the data set, only entries. So, this analysis does not estimate the effect of exit on volumes or fees; and,

(b) second, almost all entrants are private crematoria.[3] As such, this analysis does not allow us to distinguish between the effects of entry by entrant

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[3] In total, 46 instances of entry took place from 2008 to 2018, of which 44 were private crematoria. This analysis excludes three replacements of existing crematoria between 2008 and 2018 as the replacement of an existing crematorium does not change the number of crematoria in a local area.

type. However, as almost all entries were by private providers, the results may approximate the effect of entry by a private crematorium.[4]

Econometric model

8.   Our econometric model allows us to estimate the average effect of one additional crematorium on an incumbent's volume or fee. This is done through a fixed effects approach. More specifically, our specification captures the relationship between changes in the volume or fee generated at each crematorium and the variation (due to entry) in the number of crematoria within each drive time band.[5] We estimate the following reduced form regression:

$$\log(Y_{it}) = \sum_{d} \beta_d N_{d,it} + \delta_i + \delta_t + \varepsilon_{it}$$

9.   Where Y_{it} is either the volume or fee for crematorium i in year t; $N_{d,it}$ is the number of crematoria within drive time band d of crematorium i in year t; δ_i and δ_t are crematorium and year fixed effects respectively; and ε_{it} is the error term.

10.   For each drive time band, as set out in paragraph 4, the model estimates a coefficient β_d which approximates the average percentage change in the volume or fee at an incumbent crematorium following entry of an additional crematorium in the given drive time band.[6] If a coefficient is negative and significantly different from zero, it means that volumes or fees decrease

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[4] On the other hand, if the effect from a local authority entrant was significantly different to the effect from a private entrant, then the results of this analysis could not be applied to instances of local authority entry (in the rare instances where they occur).

[5] The variation is measured with respect to the average number of crematoria within each drive time band.

[6] Memoria has noted that our analysis does not take account of the fact that in a few instances the entrant is operated by the same crematoria provider as the incumbent (that is, this type of entry does not change the fascia count). We note that this occurs in a limited number of instances. Within a 10-20 minute normal drive time (17-33 minute cortege drive time) band, there is one incumbent crematorium (out of 35 entry experiences) where the entrant and incumbent are operated by the same provider, and within the 20-30 minute normal drive time (33-50 minutes cortege drive time) band, there are seven incumbent crematoria (out of 78 entry experiences) where the entrant and incumbent are operated by the same provider. Where entry occurs and an incumbent and entrant are operated by the same provider the entrant and incumbent are typically relatively far apart (and never closer than a 20 minute normal drive time/33 minute cortege drive time), and typically face other, closer, rivals (in 6 out of the 8 instances there are at least two other closer crematoria to the incumbent than the entrant). This would likely weaken the upward pricing incentive the operator may have as a result of operating two crematoria in the same local area. In these instances of entry, the price changes at incumbent crematoria in the year of entry compared to other years between 2008-2018 does not appear materially different on average (we compared the CAGR in fees over the period 2008-2018 with the fee change between the year before entry and the year of entry and found that on average these differences are zero). Based on this, in particular the small number of instances (out of the total) of entry by a crematorium under the same ownership as the incumbent and the fact that, in most of these instances, entry is relatively far away from the incumbent and there are closer rivals, we do not expect the inclusion of these observations to materially affect the results of our analysis.

following the entry of an additional crematorium within the relevant drive time band.

11.   We estimate an additional specification of the econometric model to assess whether the impact of entry on volumes or fees is significantly different between incumbent local authority and private crematoria. This estimation is performed by adding an interaction term for each drive time band to the reduced form regression above. The interaction term is given by the number of crematoria within each drive time band from the incumbent crematorium multiplied by a dummy variable for whether the incumbent crematorium is privately operated.

12.   Under the additional specification, for each drive time band, the coefficient β_d approximates the average percentage change in the volume or fee at an incumbent local authority crematorium following entry within the relevant drive time band. The coefficients of the interaction terms estimate the difference in the average percentage change in volume or fee following entry within the relevant drive time band between private and local authority incumbent crematoria. This means that the estimated average effect of entry on an incumbent private crematoria's volume or fee can be obtained as the sum of the coefficient β_d and the interaction term coefficient within the same drive time band.

13.   The estimated effect of entry on incumbent private crematoria is considered statistically different from the estimated effect on incumbent local authority crematoria if the coefficient of the interaction term is statistically significant in Table 2, Table 3 and Table 6.

Strengths and limitations

14.   The principal concern in a PCA is that the extent of local competition (that is, the number of crematoria in a local area) is driven by factors such as local costs and characteristics of demand that also affect crematorium performance (in this case, volume or fee). When these factors are not included in the model specification (the issue is referred to as 'omitted factors'), the results would be biased, as we would wrongly be conflating the impact of such factors on performance with that of local competition.[7] Whether this bias causes the

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[7] For example, not accounting for mortality rate may result in an upward bias. An area with a higher mortality rate may have more crematoria but these crematoria may also have higher volumes and/or fees. This introduces a positive relationship between volume and/or fee and the number of crematoria in an area, which confounds the competition effect.

model to under- or over-estimate the impact of competition on performance depends on how these omitted factors affect performance.

15. The fixed effects regression helps to address this concern, by holding constant all crematoria-specific and area-specific factors that do not vary over time.[8] Our econometric model also accounts for factors that change over time and are common to all crematoria through the year fixed effect (δ_t).[9]

16. Even so, it is possible that there are local factors that vary over time and which are correlated with both local competition and performance, which our model does not account for. For example, increases in local demand are likely to attract new entrants and also increase the volumes and/or fees at crematoria. Omitting this factor from the model specification would mean that the changes in incumbent's volumes or fees would be wrongly entirely attributed to the effects of entry, causing a positive bias in the results.

17. A positive bias means that estimated decreases in volumes and/or fees by crematoria experiencing entry would be smaller than the actual decrease, and any estimated increases would be larger than the actual increase. We do not know the magnitude of the bias, nor the extent to which this bias will differ across local areas. We can give more weight to statistically significant negative results, because once the bias is accounted for these results would remain negative.

18. More generally, the interpretation of a non-statistically significant result is that our estimation is not precise enough to capture a statistically significant effect. That is, non-significance in statistical terms is a lack of evidence of an effect, rather than being evidence of a lack of effect. Non-statistical significance could be due to the following reasons:

    (a) New entrants genuinely do not compete with the incumbent, and so there is no evidence to be found of a competitive response.

    (b) The model is unable to detect any effect of entry due to a small number of these entries over the period. In this case any effect of entry is dwarfed by other variation in the data set, leading to imprecise results. In paragraph 6 we note that there are a reasonable number of entries across most drive time bands.

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[8] For example, crematorium chapel size.
[9] For example, national trends and general price inflation.

Parties' comments on the econometric model

Omitted factors

19. Dignity,[10] Westerleigh,[11] and Memoria[12] stated that our analysis does not control for all of the relevant factors that may change over time which may affect the volume of cremations conducted by a crematorium and the price set by a crematorium. Dignity and Memoria identified some potentially relevant measurable factors that are omitted from our model. These factors are death rates, demographics, income levels, cost inflation, slot length and investments.[13]

20. We have noted in paragraph 16 that the omission of local factors (in particular, local demand) which vary over time and which are correlated with both local competition and performance from our model would lead to a positive bias in the results. We take this bias into account when interpreting our results.

21. In relation to the specific omitted factors identified by Dignity and Memoria, we have considered whether their omission is likely to affect our model (this would be the case if these factors varied significantly over time and the magnitude of these trends were significantly different between local areas). If so, we have considered whether the corresponding data is available and can be included in our model:

     (a) Death rates, demographics and income levels: there may be some variation in these factors over time, and the trends could differ between local areas. However, yearly data is only available at the local authority level and we consider that this data is unlikely to align with the local area over which crematoria are likely to compete.

     (b) Cost inflation: this is likely to be common across crematoria, and as such we consider that this variation is likely to be reasonably well approximated by the year fixed effect (δ_t in the model presented at paragraph 8, see paragraph 15).

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[10] Dignity plc response to the CMA's working papers on cremation services of 30 January 2020, 27 February 2020, Annex 2 paragraph 2i.
[11] Westerleigh Group, Westerleigh Group's response to the CMA's entry analysis, 10 March 2020, paragraph 7b and 35d.
[12] Memoria Ltd, Response to the CMA's working papers published on 30 January 2020, 20 February 2020, page 10 and 43.
[13] Dignity plc response to the CMA's working papers on cremation services of 30 January 2020, 27 February 2020, Annex 2 paragraph 2i and Memoria Ltd, Response to the CMA's working papers published on 30 January 2020, 20 February 2020, page 11.

(c) Investments and slot lengths: entry may lead to changes in these factors; therefore they are performance variables, which should not be included in an econometric model where the effect of entry on a different performance variable (in this case, volume or fee) is estimated.

22.   Therefore, for the reasons set out above, we have not included these factors in our model. Where omitted factors are more likely to affect the results, we account for any bias when interpreting our results.

Results

23.   Where we draw on specific results in the text below, we identify the relevant coefficient, and its statistical significance, from the tables in brackets. The asterisks indicate that the result is significantly different from zero with the following confidence levels: *90%, **95%, ***99%.

24.   In interpreting the results, we place greater weight on results which are statistically and economically (as indicated by the magnitude of the effect) significant.[14]

Impact of entry on volumes

25.   Table 2 presents the results of the model and the additional specification in relation to the impact of entry on volumes. The dependent variable is in logarithms, so the coefficients in the table (multiplied by 100) approximate the percentage change in volumes resulting from the entry of an additional crematorium within a given drive time band.

26.   Overall the results suggest that:

(a) Entry has a statistically significant negative impact on volumes and this effect decreases the further away entry occurs. For example, Column (1) shows that one additional crematorium within the 10-20 minute normal (17-33 minute cortege) drive time band reduces an incumbent's volume by 20% (-0.203***). This effect decreases to approximately a 7% (-0.0673**) reduction when the additional crematorium is within the 20-30 minute normal (33-50 minute cortege) drive time band. The effect on volumes from an additional crematorium in the 30+ minute normal (50+

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[14] Statistical significance is explained in the notes to the results tables. A result is economically significant where the magnitude of the result is different enough from zero to be of interest in the context of what is being considered (for example, if incumbents lost a negligible amount of volume after entry, this is unlikely to be of interest).

minute cortege) drive time band is found to be not significantly different from zero (-0.00823).

(b) There is no clear evidence that the effect of entry on volumes significantly differs by incumbent type. Column (2) shows that, in the 10-20 minute normal (17-33 minute cortege) drive time band, incumbent private crematoria lose greater volumes compared with incumbent local authority crematoria following the entry of a new crematorium.[15] In the 20-30 minute normal (33-50 minute cortege) drive time band[16] there is no difference in the volume losses at incumbent private and local authority crematoria. In the 30+ minute normal (50+ minute cortege) drive time band, volumes at local authority crematoria are reduced by 2% (-0.0244***) whilst volumes at private crematoria increase by approximately 3% (-0.0244 + 0.0586). In relation to the latter, we would not expect entry to lead to increased volumes at incumbent crematoria, particularly those that are over 30 minutes normal (50+ minute cortege) drive time away.

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[15] We place less weight on this result given that it is based on a small number of observations and is estimated to a 90% confidence level.
[16] Which includes two-thirds of entry events in a 30-minute normal drive time.

Table 2: Estimated percentage volume effect on incumbent crematorium from entry

Drive time band (normal, min)	Drive time band (cortege, min)	(1) Ln (volume)	(2) Ln (volume)
0-10	0-17	-0.306***†	
		(0.0838)	
10-20	17-33	-0.203***	
		(0.0337)	
20-30	33-50	-0.0673**	
		(0.0318)	
30+	50+	-0.00823	
		(0.00782)	
Effect on local authority (LA):			
0-10	0-17		-0.288***†
			(0.0864)
10-20	17-33		-0.174***
			(0.0373)
20-30	33-50		-0.0965***
			(0.0226)
30+	50+		-0.0244***
			(0.00783)
Effect on private: (difference to effect on LA)			
0-10	0-17		*No instances*
			(0)
10-20	17-33		-0.118*†
			(0.0712)
20-30	33-50		0.0647
			(0.0804)
30+	50+		0.0586***
			(0.0176)
Observations		3,209	3,209

Source: CMA analysis.
† denotes drive time bands in which a small number of incumbents experienced entry.
Note: Standard errors are reported in parenthesis. All standard errors are clustered at the crematoria level. Asterisks indicate that the result is significantly different from zero with the following confidence levels: *90%, **95%, ***99%.

Parties' comments

Aggregating drive time bands

27. Memoria and Westerleigh used an alternative specification of the model in which the drive time bands are aggregated up to a 30-minute normal (50 minute cortege) drive time. Memoria and Westerleigh state that the results from this model show that local authority crematoria lose greater volumes compared with private crematoria when experiencing entry. Their alternative model estimated that local authority crematoria experiencing entry within a 30 minute normal drive time lose 15% of their volumes, whilst private crematoria experiencing entry within 30-minutes only lose 4% of their volumes.[17]

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[17] Westerleigh Group, Westerleigh Group's response to the CMA's entry analysis, 10 March 2020, paragraphs 29-30 and Memoria Ltd, Response to the CMA's working papers published on 30 January 2020, 20 February 2020, page 41.

28. In considering this alternative specification and corresponding results, we note that:

   (a) Aggregating drive time bands conceals mix effects. Local authority crematoria who experience entry within a 30-minute normal drive time are more likely to be closer to the entrant than private crematoria.[18] As such, this aggregated model specification finds that local authority crematoria lose greater volumes than private crematoria, but this result is likely to be driven by local authority crematoria experiencing closer entries than private crematoria (which drive greater volume losses than entries further away) rather than by the different identities of the operators. In contrast, our disaggregated specification allows for a like-for-like comparison of the effects of entry on private and local authority incumbents when they experience entry at similar drive time distances; and,

   (b) furthermore, an aggregated model specification does not allow us to examine the extent to which the effect of entry varies by drive time band. This is important as we are particularly interested in how proximity between crematoria increases the extent of any competitive constraint, and whether this varies by crematoria type.

29. Therefore, we consider our analysis preferable in assessing the extent to which any competitive constraint increases with proximity between crematoria, and whether this varies by crematoria type.

Including further drive time bands

30. Memoria provided alternative specifications with drive time bands aggregated and disaggregated up to 40-minutes.[19] As set out above, we consider using disaggregated time bands to be preferable in order to understand the effect of entry on volumes and how this varies by drive time.

31. On the inclusion of a 30-40 minute normal (50-67 minute cortege) drive time band, Memoria's results estimated that local authority crematoria experiencing entry within 30-40 minutes normal drive time lose 4% of their volumes, whilst

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[18] Table 1 shows that of those crematoria experiencing entry within a 30-minute normal (50 minute cortege) drive time over the period considered, local authority crematoria are more likely to experience entry within a shorter drive time. Thirty out of 78 (38%) local authority crematoria experiencing entry had an entrant enter within a 20 minute normal (33 minute cortege) drive time, whilst a lower proportion (19%) of private crematoria experiencing entry had an entrant enter within a 20 minute normal drive time (private crematoria are more likely to experience entry in the 20-30 minute drive time band).

[19] Memoria Ltd, Response to the CMA's working papers published on 30 January 2020, 20 February 2020, pages 41-42.

volumes at private crematoria experiencing entry within 30-40 minute normal drive time increase by 4%.[20]

32.   In relation to these results, we note:

   (a) The estimated effect on local authorities is relatively small compared to the estimated effects in closer drive time bands; and,

   (b) the result that private crematoria gain volumes when experiencing entry between 30-40 minute normal drive time away is counterintuitive, as we would not typically expect the entry of a rival to lead to increased volumes at incumbent crematoria.

33.   Additionally, our analysis of the 30+ minute normal drive time band found no statistically significant effect when looking at all crematoria and counterintuitive results when looking at private crematoria. Further, we set out below an extension to our analysis using 5-minute drive time bands which finds no statistically significant effect in normal drive time bands above 25 minutes. Therefore, we don't consider that a drive time band of 30-40 minutes is particularly informative for our analysis.

Exclude initial years of operation

34.   Memoria noted that most new crematoria experience large increases in volumes during their initial years of operation. To the extent that a relatively new crematorium itself later becomes an incumbent, Memoria notes: "the [incumbent] sample size is relatively small and includes many crematoria that themselves are rather new and are still in the growth phase… The inclusion of these new [incumbent] crematoria disrupts the results, in many cases comparing partial year volumes with full year volumes- with this growth then potentially misattributed to the effect of other crematoria entering."[21] To control for this potential issue, Memoria provided an alternative specification in which all incumbent crematoria in their first two years of operation are dropped from the data set.[22]

35.   When comparing the results of this alternative specification to the results of our analysis, we do not find any significant differences between the two sets of results for bands up to a 30-minute normal (50-minute cortege) drive time. In particular, the results from our specification in Table 2 show that the effect

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[20] Memoria Ltd, Response to the CMA's working papers published on 30 January 2020, 20 February 2020, page 42.
[21] Memoria Ltd, Response to the CMA's working papers published on 30 January 2020, 20 February 2020, page 39.
[22] Memoria Ltd, Response to the CMA's working papers published on 30 January 2020, 20 February 2020, page 42.

of entry on private crematoria volumes is not statistically significantly different from the effect on local authority crematoria, with the exception of the 10-20 minute normal (17-33 minute cortege) drive time band in which we find that private crematoria lose greater volumes compared with local authority crematoria (although there are only a few instances of entry in this drive time band and the result is only estimated to a 90% confidence level). Results from Memoria's alternative specification do not show any statistically significant difference between volume losses at local authority crematoria compared with private crematoria in this drive time band.

36. As such, we do not consider that this alternative specification materially changes our findings that incumbent crematoria lose volumes when experiencing entry and these volume losses are greater the closer the entrant is to the incumbent, and that the effect does not differ between local authority and private crematoria.

Lagging the effect of entry

37. Dignity noted that our analysis of how incumbent volumes are affected by entry includes entrants who have entered part way through the year. Dignity states: "when entry occurs late in the year, the entrant has less volumes in that first year. It would also have a more limited impact on the incumbents' volumes in that year of entry as the entrant would have been operating for a few months only. There is, therefore, a substantial risk that measuring an entrant's effect on incumbents 'in the year of entry' will underestimate the true effects."[23] To control for this potential issue, Dignity has provided an alternative specification in which the effect of entry on an incumbent is lagged by one year.

38. When comparing the results of this alternative specification to the results of our analysis, we do not find any material differences between the two sets of results. In particular, looking at drive time bands with a reasonable number of entries:

   (a) Our specification finds that crematoria experiencing entry within a 10-20 minute normal (17-33 minute cortege) drive time lose 20% of their volumes. Dignity's specification finds that these crematoria lose 21% of their volumes;[24]

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[23] Dignity submission on the CMA's quantitative analysis of entry in the crematoria market, 12 June 2020, paragraph 2.9.
[24] Both results are significant at the 99% confidence level.

(b) our specification finds that crematoria experiencing entry within a 20-30 minute normal (33-50 minute cortege) drive time lose 7% of their volumes. Dignity's specification finds that these crematoria lose 10% of their volumes; and,[25]

(c) both specifications find no statistically significant effect on volumes at crematoria experiencing entry in the 30+ minute normal (50+ minute cortege) drive time band.

39. As such, we do not consider that this alternative specification materially changes our findings that incumbent crematoria lose volumes when experiencing entry and these volume losses are greater the closer to the incumbent the entrant is.

Exclude entrants from 2017 and 2018

40. Dignity noted that our analysis of how incumbent volumes are affected by entry includes entrants who have entered in the latter part of the period that we examined (entry occurring in 2017 and 2018).[26] Dignity states that it "considers that the results of the CMA's analyses risk being skewed by these late entries as they have limited post-entry data."[27] Dignity provided an alternative specification of the model in which entrants in 2017 and 2018 are excluded.

41. When comparing the results of this alternative specification to the results of our analysis, we do not find any material differences between the two sets of results. In particular, looking at drive time bands with a reasonable number of entries:

(a) Our specification finds that crematoria experiencing entry within a 10-20 minute normal (17-33 minute cortege) drive time lose 20% of their volumes. Dignity's specification finds that these crematoria lose 21% of their volumes;[28]

(b) both specifications find that crematoria experiencing entry within a 20-30 minute normal (33-50 minute cortege) drive time lose 7% of their volumes; and,[29]

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[25] Our result is significant at the 95% confidence level, Dignity's result is significant at the 99% confidence level.
[26] Dignity submission on the CMA's quantitative analysis of entry in the crematoria market, 12 June 2020, paragraph 3.5.
[27] Dignity submission on the CMA's quantitative analysis of entry in the crematoria market, 12 June 2020, paragraph 2.7.
[28] Both results are significant at the 99% confidence level.
[29] Both results are significant at the 95% confidence level.

(c) our specification finds no statistically significant effect in the 30+ minute normal (50+ minute cortege) drive time band. Dignity's specification finds that these crematoria lose 2% of their volumes, significant at the 95% confidence level.

42.   Therefore, we do not consider that this alternative specification materially changes our findings that incumbent crematoria lose volumes when experiencing entry and these volume losses are greater the closer to the incumbent the entrant is.

Impact of entry on fees

43.   Table 3 presents the results of the model and additional specification in relation to the impact of entry on fees. The dependent variable is in logarithms, so the coefficients in the table (multiplied by 100) approximate the percentage change in fees resulting from the entry of an additional crematorium within a given drive time band.

44.   Overall the results suggest that:

(a) There is a limited impact of entry on the cremation fee charged by incumbents when not accounting for incumbent type and, when there is an impact, it is positive and, as such, in a direction opposite to what we would expect from a competitive response (since we would expect the presence of more competitors to lead to lower fees). For example, Column (1) indicates that only entry in the 20-30 minute normal (33-50 minute cortege) drive time band has a statistically significant effect on fee, where fees increase by around 2% (0.0206**) with one additional crematorium in the drive time band.

(b) When accounting for incumbent type, the effect of entry on fee is different between incumbent local authority and private crematoria. Column (2) shows that across all drive time bands the impact of entry on a local authority crematorium's fee is not statistically significant. However, the entry effect on a private crematorium's fee is statistically significant, although the direction of the effect is opposite to what we would expect from a competitive response. Incumbent private crematoria fees increase by approximately 7% (0.0689**) with one additional crematorium within a 10-20 minute normal (17-33 minute cortege) drive time,[30] with this effect reducing the further away entry occurs – entry within 20-30 and 30+

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[30] We note that this finding is based on a small number of observations, see paragraph 6. However, if excluding this result, the finding remains that the size of the fee increase reduces as distance to the entrant increases.

minutes normal (33-50 and 50+ minute cortege) drive time increases the fee by around 5% (0.0482**) and 2% (0.0202**) respectively.

Table 3: Estimated percentage fee effect on incumbent crematorium from entry

Drive time band (normal, min)	Drive time band (cortege, min)	(1) Ln (fee)	(2) Ln (fee)
0-10	0-17	0.0443†	
		(0.0494)	
10-20	17-33	0.00188	
		(0.0160)	
20-30	33-50	0.0206**	
		(0.0104)	
30+	50+	-0.00193	
		(0.00440)	
Effect on local authority (LA):			
0-10	0-17		0.0507†
			(0.0483)
10-20	17-33		-0.00479
			(0.0174)
20-30	33-50		-0.000615
			(0.0120)
30+	50+		-0.00759
			(0.00495)
Effect on private: (difference to effect on LA)			
0-10	0-17		*No instances*
			(0)
10-20	17-33		0.0689**†
			(0.0289)
20-30	33-50		0.0482**
			(0.0198)
30+	50+		0.0202***
			(0.00746)
Observations		3,184	3,184

Source: CMA analysis.
† denotes drive time bands in which a small number of incumbents experienced entry.
Note: Standard errors are reported in parenthesis. All standard errors are clustered at the crematoria level. Asterisks indicate that the result is significantly different from zero with the following confidence levels: *90%, **95%, ***99%.

Parties' comments

Crematorium-specific time trends

45.   Westerleigh suggested an alternative specification with the year fixed effect variable (δ_t in the model presented at paragraph 8) replaced by crematorium-specific trends.[31] This change is made to capture local factors which vary over time at individual crematoria that may be correlated with entry and fees, thereby mitigating the potential bias described in paragraph 16.

46.   Westerleigh stated that the results of this alternative specification show a small, statistically significant, negative effect of entry on fees for most time

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[31] Westerleigh Group, Westerleigh Group's response to the CMA's entry analysis, 10 March 2020, paragraph 35e.

bands.[32] We analysed the code provided by Westerleigh and produced results based on their specification. When looking at drive time bands with a reasonable number of entries, the results show:

(a) Crematoria experiencing entry within a 10-20 minute normal (17-33 minute cortege) drive time reduce their fee by 5%, significant at the 99% confidence level;

(b) no statistically significant effect on fees at crematoria experiencing entry within a 20-30 minute normal (33-50 minute cortege) drive time;

(c) crematoria experiencing entry within a 30-40 minute normal (50-67 minute cortege) drive time reduce their fee by 1%, significant at the 90% confidence level; and,

(d) crematoria experiencing entry outside of a 40-minute normal (67-minute cortege) drive time reduce their fee by 2%, significant at the 99% confidence level.

47. However, the use of crematorium-specific trends does not capture changes in factors over time which are common to all crematoria.[33] To capture the effects of changes in factors which are common to all crematoria, a year fixed effect variable should be included in the model. To test the robustness of Westerleigh's specification, we therefore estimated an alternative specification of the model in which the year fixed effect variable is added to Westerleigh's specification. We found the estimates of the impact of entry on incumbent's fees to be not statistically significant in all drive time bands with a reasonable number of entries, a result similar to our estimates set out in Column (1) of Table 3.

Extensions

48. In this section we explore two extension to the analysis above. First, how incumbent crematoria volumes are affected by entry using 5-minute drive time bands. Second, how incumbent crematoria slot lengths are affected by entry through an equivalent version of the model, and the additional specification, as set out from paragraph 8.

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[32] Westerleigh Group, Westerleigh Group's response to the CMA's entry analysis, 10 March 2020, paragraph 35e.
[33] Further, the use of crematorium-specific trends is restrictive as it relies on the assumption that there is a linear trend in the local factors which vary over time at each crematorium, and this may not be the case. The year fixed effect variable does not require this assumption.

Using 5-minute drive time bands

49.　This extension adjusts the fixed effects model set out in paragraph 8 by replacing the 10-20 and 20-30 minute normal (17-33 and 33-50 minute cortege) drive time bands with drive time bands at 5 minute normal (8 minute cortege) drive time intervals. This is done to provide a more granular view of the effect of entry on volumes at incumbent crematoria.

50.　To provide robustness to these results, through maximising the number of observations within each 5-minute drive time band, the additional specification (as set out from paragraph 11) is not used in this extension.

51.　As set out in paragraph 6, the representativeness and the reliability of the estimated impacts of entry on volumes and fees depend on the number of observations available: the higher the number of entries experienced by incumbents, the more robust our results are likely to be. In addition to Table 1, Table 4 shows the number of entries experienced by incumbents during the time period covered by the data set, split by drive time band. Table 4 shows that only eight crematoria experienced entry within the 10-15 minute normal (17-25 minute cortege) drive time band.

Table 4: Number of entries experienced within each drive time band, 2008 – 2018

Drive time band (normal, min)	Drive time band (cortege, min)	Number of entries experienced
5-10	8-17	2
10-15	17-25	8
15-20	25-33	27
20-25	33-42	40
25-30	42-50	38

Source: CMA analysis.
Note: No entries were experienced within a 0-5 minute drive time band.

52.　Table 5 presents the results of the extension. The dependent variable is in logarithms, so the coefficients in the table (multiplied by 100) approximate the percentage change in volumes resulting from the entry of an additional crematorium within a given drive time band.

53.　Overall the results suggest that entry has a statistically significant negative impact on volumes and that this effect decreases the further away entry occurs. Table 5 shows that with one additional crematorium within the 10-15 minute normal (17-25 minute cortege) drive time band reduces an incumbent's volume by approximately 29% (-0.287***).[34] This effect decreases to a 10% (-0.102***) reduction when the additional crematorium is within the 20-25 minute normal (33-42 minute cortege) drive time band. The

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[34] We note that this finding is based on a small number of observations, see paragraph 51. However, if excluding this result, the finding remains that the size of the volume decrease reduces as distance to the entrant increases.

effect on volumes from an additional crematorium in the 25-30 minute normal (42-50 minute) drive time band is found to be not statistically significant.

Table 5: Estimated percentage volume effect on incumbent crematorium from entry, 5-minute drive time band extension

Drive time band (normal, min)	Drive time band (cortege, min)	Ln (volume)
5-10	8-17	-0.306***†
		(0.0836)
10-15	17-25	-0.287***†
		(0.103)
15-20	25-33	-0.182***
		(0.0313)
20-25	33-42	-0.104***
		(0.0321)
25-30	42-50	-0.0276
		(0.0461)
30+	50+	-0.00775
		(0.00785)
Observations		3,209

Source: CMA analysis.
† denotes drive time bands in which a small number of incumbents experienced entry.
Note: No entries were experienced within a 0-5 minute drive time band. Standard errors are reported in parenthesis. All standard errors are clustered at the crematoria level. Asterisks indicate that the result is significantly different from zero with the following confidence levels: *90%, **95%, ***99%.

Slot length as a performance variable

54. This extension uses slot length as a performance variable, replacing volume or fee in the fixed effects model and additional specification, as set out from paragraph 8. This version of the model assesses whether incumbent crematoria slot lengths are affected by entry.

55. We gathered data on slot lengths from the Cremation Society's annual survey of crematoria. Due to changes in the way that the Cremation Society gathered data in relation to slot length, consistent slot length data is available from 2012 onwards. Where this data was either missing or appeared incorrect (eg slot lengths were stated as being very short) we checked the data with individual crematoria.

56. Having fewer years of data, compared to the main analysis, reduces the robustness of the results for this extension as the analysis uses fewer observations.

57. Table 6 presents the results of this second extension. The dependent variable is in logarithms, so the coefficients in the table (multiplied by 100) approximate the percentage change in slot length resulting from the entry of an additional crematorium within a given drive time band.

58. The results suggest that overall entry does not have a statistically significant impact on slot length. The exception is that entry in the 0-10 minute drive time

band was found to have a negative and statistically significant effect on slot length. Column (1) shows that one additional crematorium within the 0-10 minute drive time band reduces an incumbent's slot length by 7% (-0.0743***). However, as noted in paragraph 6, the small number of observations in this drive time band is likely to affect the robustness of this somewhat counterintuitive result.

Table 6: Estimated percentage slot length effect on incumbent crematorium from entry

Drive time band (normal, min)	Drive time band (cortege, min)	(1) Ln (slot length)	(2) Ln (slot length)
0-10	0-17	-0.0743***†	
		(0.00963)	
10-20	17-33	0.0697	
		(0.0507)	
20-30	33-50	0.00818	
		(0.0256)	
30+	50+	-0.00529	
		(0.00987)	
Effect on local authority (LA):			
0-10	0-17		-0.0676***†
			(0.0112)
10-20	17-33		0.0529
			(0.0555)
20-30	33-50		-0.00697
			(0.0262)
30+	50+		-0.0142
			(0.0113)
Effect on private: (difference to effect on LA)			
0-10	0-17		*No instances*
			(0)
10-20	17-33		0.0991†
			(0.105)
20-30	33-50		0.0312
			(0.0512)
30+	50+		0.0274*
			(0.0164)
Observations		1,912	1,912

Source: CMA analysis.
† denotes drive time bands in which a small number of incumbents experienced entry.
Note: Standard errors are reported in parenthesis. All standard errors are clustered at the crematoria level. Asterisks indicate that the result is significantly different from zero with the following confidence levels: *90%, **95%, ***99%.