

Appendix U: The impact of CSAs on competition, a quantitative analysis

Introduction

- U.1 This appendix provides the technical details and summarises the main findings of our quantitative analysis on the impact of AWS' committed spend agreements/discounts (CSAs/CSDs) on competition.¹ We also explain why our results can largely be extended to Microsoft.
- U.2 Our analysis builds on AWS' economic analysis of its CSDs, as well as on further material submitted by AWS in response to our follow-up questions on its analysis.² However, we depart from AWS' approach in some aspects of its modelling in ways that we explain in the Methodology section below.
- U.3 The two main empirical questions we assessed through our quantitative analysis are whether and to what extent rivals:
 - (a) are able to compete profitably against the incumbent cloud provider for the whole contestable demand of its existing customers (ability); and
 - (b) find it more profitable to compete for the whole contestable demand, rather than a smaller proportion of contestable demand (incentive).
- U.4 The rest of this paper is structured as follows. We first summarise the analysis submitted by AWS. We then set out our own analysis by describing the data, the methodology, the caveats to the analysis and finally the results.
- U.5 Overall, our results indicate that in the vast majority of cases rivals would have both the ability and the incentive to compete for AWS' customers over a broad range of potential increases in customers' demand. These conclusions hold for rivals that are less profitable than AWS.

Our analysis of AWS' data building

- U.6 We performed an analysis of AWS' data building on AWS' submission.

¹ In this paper, we use the terms CSA and CSD almost interchangeably. More rigorously, though, the former denotes the agreement between the cloud provider and its customer, whereas the latter indicates the discount agreed upon by the two parties.

² AWS' submission to the CMA [X].

AWS submission

- U.7 AWS submitted that the structure and level of AWS' discounts is such that efficient rivals can compete on incremental demand.³ To this end, AWS' analysis looked at whether a competitor, which is at least as profitable as AWS itself, can profitably compete for the incremental demand (assumed to be contestable) of customers who have existing demand (assumed to be non-contestable) and an existing CSD with AWS.
- U.8 [REDACTED].
- U.9 AWS submitted that the results of its analysis showed that AWS' CSDs could not foreclose rivals.⁴ [REDACTED]:
- (a) [REDACTED];⁵ [REDACTED]
- (b) [REDACTED].⁶
- U.10 AWS' initial analysis only considered ability to compete. We asked AWS to extend this analysis through a series of sensitivities, including to assess a rival's incentive to compete for the whole incremental demand. AWS updated its analysis and submitted that:
- (a) [REDACTED] rivals had both the ability and an incentive to compete over the whole contestable demand;⁷
- (b) even assuming that [REDACTED] to [REDACTED] of the hypothetical incremental demand was non-contestable, rivals could compete in the vast majority of cases;⁸ and
- (c) [REDACTED].⁹
- U.11 We note that the approach taken by AWS to assess rivals' ability and incentive to compete is different from our own approach, as set out in more detail in the Methodology section below.

³ AWS' submissions to the CMA [REDACTED].

⁴ AWS' submission to the CMA [REDACTED].

⁵ AWS' submission to the CMA [REDACTED].

⁶ AWS' submission to the CMA [REDACTED].

⁷ AWS' submission to the CMA [REDACTED].

⁸ AWS' submission to the CMA [REDACTED].

⁹ AWS' submission to the CMA [REDACTED].

Data

- U.12 For our analysis, we used a data set containing information on [REDACTED] CSDs signed by UK customers between April 2017 and September 2023.¹⁰ This is the same data set used by AWS for its own analysis as described in the previous section.
- U.13 For the purposes of our quantitative analysis, the main variables of interest for each CSD in the data set are the following:
- (a) the 'total commitment', ie the total amount (in USD) that the customer has committed to spend on AWS' eligible services;
 - (b) the 'CSD length', ie the agreed contract duration (in years);
 - (c) the discount rate given by the CSD; and
 - (d) the expected 'net' margin (ie the margin after interest and tax, after the discount is applied) achieved by AWS on the specific CSD.
- U.14 AWS submitted that the offered discount rate is largely dependent on the size of total commitment and on contract duration.¹¹ Based on this, we estimated a discount schedule ('the schedule') according to which, all else being equal the rate of CSDs:¹²
- (a) increases with the level of customer's committed spend; and
 - (b) increases with an increase in contract length.
- U.15 We performed our analysis on a subset of [REDACTED] observations out of the [REDACTED] CSDs available in the full data set. In doing so, we excluded the following:¹³
- (a) [REDACTED] CSDs which [REDACTED].¹⁴
 - (b) [REDACTED] CSDs with public organisations (eg, government departments and local councils) which fall under the 'One Government Value Agreement' (OGVA), ie a collective agreement between AWS and UK Government, by which public sector entities are treated as a single customer [REDACTED].¹⁵ Including these CSDs would bias the results, [REDACTED].
 - (c) [REDACTED] CSDs with annual commitment lower than [REDACTED].

¹⁰ [REDACTED] response to the CMA's information request [REDACTED].

¹¹ AWS' submission to the CMA [REDACTED].

¹² [REDACTED]. [REDACTED] submission to the CMA [REDACTED].

¹³ AWS' submission to the CMA [REDACTED].

¹⁴ AWS submitted that [REDACTED]. We asked AWS to provide a separate analysis on contracts [REDACTED]. It submitted that, as with the main analysis, a rival would be able to profitably compete, under a range of margin values, for virtually all contracts [REDACTED]. AWS' submission to the CMA [REDACTED].

¹⁵ [REDACTED] submission to the CMA [REDACTED].

Methodology

- U.16 For each of the [X] CSDs in AWS' data set, we simulated an increase in the customer's demand varying from 10% to 150% of the existing commitment underpinning that CSD.¹⁶ We call this increase in demand the 'incremental demand'. We assumed that the incremental demand was entirely contestable, and that the existing commitment was entirely non-contestable. In each of the simulated scenarios, we then computed what discount the customer would get by committing the incremental demand to AWS, according to the schedule.
- U.17 We next calculated the discount rate that a competitor would have to apply to win the customer's incremental demand in each hypothetical scenario. We then compared that discount to a measure of gross margin achieved by the competitor.¹⁷
- U.18 The discount the rival needs to apply:
- (a) increases with the incremental discount rate applied by AWS, ie, the difference between the rate that the incumbent would offer on the increased commitment (following the hypothetical increase in demand) and the actual discount rate in the original CSD; and
 - (b) decreases with the size of the incremental demand.
- U.19 As the size of the incremental demand increases, the customer might get offered a higher discount rate depending on how much of that incremental demand it is willing to commit. That is because AWS tends to offer higher discount rates for larger commitments. Therefore, the incremental demand can influence the discount that the rival needs to apply in two ways: either directly, insofar as winning a larger incremental demand allows the competitor to spread the compensation to customers for any discount loss over a larger demand base; and indirectly, insofar as a larger incremental demand gives the customer the opportunity to commit more and get a higher discount rate as a result.
- U.20 In our analysis, we depart from AWS' approach in relation to two elements:
- (a) rivals' efficiency: AWS focuses on rivals that are at least as profitable as AWS. Instead, we allow for varying degrees of profitability. The reason for this is that we would be concerned about any impact of CSDs on the ability or

¹⁶ As an example, let's consider a hypothetical customer with an existing commitment equal to \$10 million (gross of discount). In this case, the hypothetical value of the customer's increased demand will range from \$11 million to \$25 million.

¹⁷ As a starting point, we define 'gross margin' as the margin (after interest and tax) earned by AWS on a specific CSD before the existing discount from that CSD is applied. For each CSD, this gross margin is calculated by adding up the existing discount rate from that CSD to AWS' estimate of the expected margin after interest and tax on that specific CSD after the discount is applied – what AWS calls 'net margin'. We then also allow for the rival's gross and net margin to be lower than AWS', as explained below.

incentive of less efficient competitors to compete. In practice, this translates into using lower values for the rival's net margin as a benchmark. As a lower bound, we used a value of net margin which is significantly lower than AWS' average of [X]% – this translates to a net margin of around [X]%.¹⁸ [X].¹⁹

- (b) the proportion of incremental demand which is covered by commitment: we allow for only a fraction of the customer's incremental demand to be taken up by an increase in the customer's commitment. In other words, we allow for the incremental demand to be at least partially free from any extra commitment. This allows us to look at whether rivals have the incentives to compete for the whole incremental demand or just for the uncommitted incremental demand. [X]. However, one possible effect of CSDs is that rivals experience a substantial drop in profitability if they encroach on the incumbent's commitment and therefore might find it more profitable to compete only for uncommitted demand.

U.21 In more detail, our analysis works in the following way. Starting from a data set with [X] AWS' CSDs, we built a range of scenarios for each CSD. In these scenarios:

- (a) we allowed for the rival to be less profitable than AWS. We assume net margins equal to 100%, [X]%, [X]% and [X]% of AWS' average net margin of [X]%;
- (b) we varied the incremental demand by one percentage point from 10% to 150%; and
- (c) we varied the proportion of the incremental demand left uncommitted over five values: 20%, 40%, 60%, 80% and 100%.

U.22 Where a customer appeared to receive a discount rate that [X] discount schedule, we kept constant the ratio between [X].²⁰

U.23 This results in [X] scenarios.²¹ For each of these scenarios, we checked if the rival would have the ability and incentive to compete against the incumbent:

¹⁸ [X] submission to the CMA [X].

¹⁹ See chapter 2 and appendix E. See also [CC3 \(Revised\), Guidelines for market investigations: Their role, procedures, assessment and remedies](#), paragraph 116.

²⁰ For example, let us assume a customer received an actual discount rate of x% for a commitment of \$10 million (gross) when a rate of y% was expected. That is, the ratio between the actual and the expected discount rate is x%/y%. Let us also assume a hypothetical incremental demand of 50%, such that the new commitment is £15 million (£10 million*1.5), and that the expected discount rate on such commitment would be z%. The assumption we make is that the customer will instead receive a (hypothetical) discount of z%*(x%/y%).

²¹ [X]*[X] = [X]; where [X] is the number of AWS' CSDs in the starting data set, [X] is the number of 1 percentage point increments in the range 10%–150%, [X] is the number of values we considered for the proportion of the incremental demand left uncommitted, and [X] is the number of values we considered for the rival's net margin relative to AWS' net margin.

- (a) ability – we computed the total profits the rival would make if it won the customer's incremental demand. These are calculated by the difference between the net margin achieved by the rival on that CSD on one hand, and the discount that a competitor would have to apply to win the customer's incremental demand, all multiplied by the incremental demand on the other hand. If the total profits are positive or equal to zero, the rival is deemed as having the ability to compete.
 - (b) incentive – we estimated the difference between the total profits the rival would make if winning only the uncommitted incremental demand on one hand, and the total profits the rival would make if winning the whole incremental demand on the other hand. If this difference is negative, the rival is deemed as having the incentive to compete for the whole incremental demand.
- U.24 Finally, we weighted each scenario by the commitment value of the original CSD underpinning that scenario as a share of the aggregate value of commitments on all CSDs analysed.
- U.25 As explained in chapter 8, we have considered whether some incremental demand scenarios could be more likely than others. We looked at two relevant metrics: i) the average and median increment of customers' commitments upon renewal of their CSDs; ii) the average customer growth rates in cloud services spend from year to year. We concluded that scenarios where demand increments are lower are not any more likely than others in the foreseeable future.

Caveats

- U.26 Before describing the results, we note some caveats to the analysis. An important driver for the results of the assessment is the structure of the incumbent's discount [X]. The results of our quantitative analysis, therefore, are heavily dependent on the specific empirical values of the discount rates offered by AWS to its customers.
- U.27 The fact that, based on such values, we have found little to no concern for rival's ability and incentive to compete does not imply that this conclusion is robust to different structures of the [X]. Key to this is the rate at which discounts increase as commitments increase: the higher this is the more likely we are to find a concern. If this feature of the [X] were to change, this might lead to different results and potentially a different overall finding. However, based on our analysis, we consider the [X] would have to change materially for this to be the case.
- U.28 We have also run the analysis [X] and found similar results.

- U.29 Finally, we note that the scenarios used in the assessment are meant to reproduce a range of hypothetical although plausible customer demand increments. In choosing to align with AWS' approach, we are aware that the results presented below are conditional upon the specific range selected (ie, 10%–150%). Although we make some high-level considerations on what demand increment scenarios may be more likely to materialise, we are not implying that the chosen range is in itself representative of expected demand growth patterns (eg scenarios in the higher end of the range may become ever less relevant if demand becomes more sticky).

Results

Ability

- U.30 Our results indicate that rivals would be able to compete over a vast range of hypothetical demand increases in the vast majority of cases. In particular, we found that:
- (a) for any given share of incremental demand which is committed, the higher the rival's net margin, the more the occurrences where it will be able to compete;
 - (b) for any given level of rival's net margin, the higher the share of incremental demand which is uncommitted, the more the occurrences where the rival is able to compete;
 - (c) for any given level of rival's net margin and for any given proportion of incremental demand which is committed, the occurrences where the rival is able to compete are fewer for low increments in demand.
- U.31 Specifically, out of the [X] possible scenarios for any given combination of rival's net margin and proportion of incremental demand which is committed, the rival is not able to compete:
- (a) at worst in 1.61% of cases. This is the scenario in which the rival's net margin is [significantly lower than] [X] AWS' and the customer commits [X]% of the incremental demand; and
 - (b) at best in 0.03% of cases. This is the scenario in which the rival's net margin is the same as AWS' and the customer only commits [X]% of the incremental demand.
- U.32 Figure U.1 below shows the results of the ability assessment, weighted by commitment value, for a rival which is [significantly less profitable than] [X] AWS and for a scenario where the whole incremental demand is committed.

Figure U.1: [X].

[X]

Source: [X]

- U.33 Figure U.1 **Error! Reference source not found.** shows that a rival which is [significantly less profitable than] [X] AWS will not have the ability to profitably compete over a significant share of CSDs (as weighted by commitment value) only for shares of incremental spend relative to existing spend below [X]%. In fact, for such demand increments, the discount rate that the competitor has to apply to win the contestable demand for some CSDs is [X]. This is because, as explained in paragraph U.19 above, the size of the incremental demand has two opposite effects on the competitor's discount:
- (a) a negative direct effect – for any given incremental discount applied by AWS, the competitor will be able to distribute the discount lost by the customer, due to any missed committed spend target, over a larger proportion of incremental demand; and
 - (b) a positive indirect effect – the extra commitment deriving from the incremental demand can result in a higher incremental discount applied by AWS.
- U.34 For shares of incremental demand relative to existing demand above [X]%, the rival would be almost always able to profitably compete over those CSDs. That is because the incremental demand is sufficiently large to recoup the cost of compensating the customer for the loss of AWS' incremental discount, which the customer incurs by not committing that demand to AWS anymore. Figure U.1 also shows that for shares of incremental demand in the region of [X]%, the rival would be able to profitably compete for CSDs (unlike shares in the region of [X]% and [X]%). This depends on the interplay between the specific values of the incremental discount rate and the hypothetical demand increments as applied to those CSDs – this interplay determines which of the effects explained above (negative direct or positive indirect) will prevail.

Incentive

- U.35 We found that a rival would generally achieve higher profits when competing for the whole incremental demand rather than only the uncommitted portion of the incremental demand. That is, we found that the rivals' incentives to compete are not limited to a small part of demand.
- U.36 Specifically, out of the [X] possible scenarios for any given combination of rival's net margin and proportion of incremental demand which is committed, the rival would not have the incentive to compete for the whole incremental demand:

- (a) at worst in 4% of cases. This is in a scenario where the rival is [significantly less profitable than] [X] AWS and the customer commits [X]% of the incremental demand; and
- (b) at best in 0.2% of cases. This is in the scenario where the rival is as profitable as AWS and the customer commits [X]% of the incremental demand.

U.37 Figure U.2 below shows the results of the incentive assessment, weighted by commitment value, for a rival which is [significantly less profitable than] [X] AWS and for a scenario where [X]% of the incremental demand is committed (and [X]% of incremental demand is left uncommitted).

U.38 We also show in Figure U.3 below the results, weighted by commitment value, for a rival which is [significantly less profitable than] [X] AWS and for a scenario where [X]% of the incremental demand is committed (and [X]% of incremental demand is left uncommitted). This is to illustrate how the results would vary with the proportion of incremental demand that is committed.

Figure U.2 [X].

[X]

Source: [X]

Figure U.3: [X].

[X]

Source: [X]

U.39 Overall, our results indicate that a rival which is [significantly less profitable than] [X] AWS would have the incentive to compete over a vast range of hypothetical demand increases increments in the vast majority of cases.

U.40 Comparing Figure U.2 and Figure U.3 above shows that, other things being equal, the lower the proportion of incremental demand which is committed, the lower the rival's incentive to compete for the whole incremental demand and the higher the incentive to compete for the uncommitted demand only. However, we note that the scenarios in Figure U.2 and Figure U.3 **Error! Reference source not found.**are not necessarily the same in terms of impact of CSDs on competition. For example, when only [X]% of the incremental demand is committed (the scenario in Figure U.3), even if a rival would not have the incentive to compete for the whole incremental demand and would rather be content with just the uncommitted demand, it would still compete for [X]% of the incremental demand, which is material.

Illustrative example

- U.41 For illustrative purposes, in Figure U.4 below we show the total profits achieved by a rival as it progressively wins units of incremental demand. This is for a CSD with spend commitment value equal to [a representative] [X] commitment value for all first-time AWS' CSDs in our data set.²² We found such value to be [X] and we assumed this to be [a representative] [X] customer's existing demand. [X]. The original discount offered by AWS on this [representative] [X] CSD is [X]%, therefore the gross value of original commitment is [X]. We then simulated a growth in the customer's demand under the following assumptions:
- (a) a 40% increase in original commitment, equal to [X]; and
 - (b) such increase in commitment accounts for 80% of the total hypothetical increase in customer's demand, with the remaining 20%[X] being uncommitted.²³
- U.42 Under such assumptions, [a representative] [X] customer's new total commitment is [X]. This is equivalent to a [X] total commitment. The related increase in [X], giving a new total demand of [X] or, equivalently, [X].
- U.43 Finally, we computed the total profits that a rival would achieve on the [X] contestable units,²⁴ on the basis of two different assumptions regarding the rival's margins: i) the rival has the same net margin as AWS; ii) the rival's net margin is [X] [significantly lower than] AWS'. These are shown, respectively, as the blue and red lines plotted in below.
- U.44 Figure U.4 shows that, for such illustrative CSD, the rival has both the ability and the incentive to compete for the whole incremental demand.²⁵

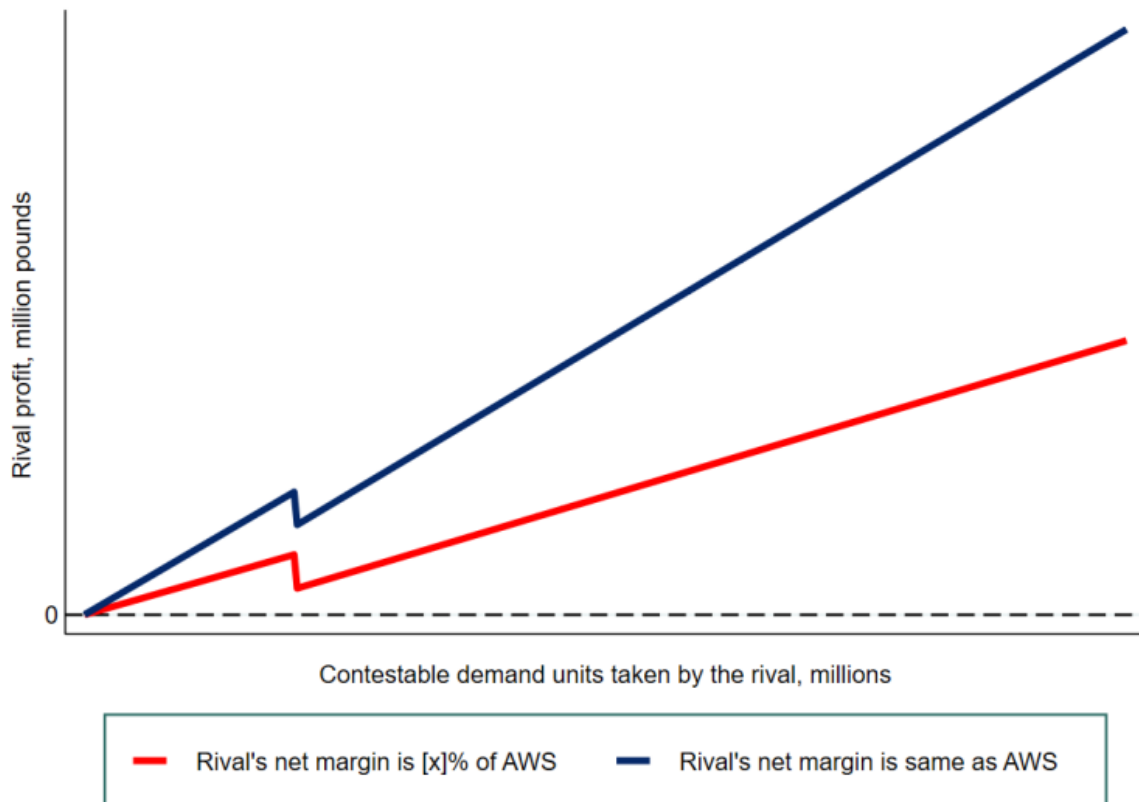
²² We identified [X] first-time CSDs out of total [X] in AWS' data set used for our analysis.

²³ Assumption (a) above reflects [X], as we derived from our analysis of AWS' CSDs presented in our CSA working paper [CMA Cloud MI Committed spend agreements working paper](#). We took this value conservatively, since this is [X]. In fact, we would expect the [X]. Assumption (b) above accounts for the fact that a [X]. Therefore, a customer's [X] may only partially be covered [X]. In our full analysis, we model several scenarios on this split between committed and uncommitted portions of the incremental demand.

²⁴ These derive from [a representative] [X] customer's [X] incremental demand under the further simplifying assumption that the unit price of cloud infrastructure services is [X].

²⁵ In order to run the ability assessment, we would need to assume that the whole incremental demand is covered by the commitment, which is different from what shown in the chart. However, making that assumption and keeping everything else equal would yields a level of total profits for the whole incremental demand which is significantly greater than zero, thereby leading to the rival having the ability to compete.

Figure U.4: Total profit to rival for different units of contestable demand it wins for [a representative] [X] AWS' CSD



Source: CMA analysis

Microsoft

U.45 We did not perform this quantitative analysis on Microsoft's CSD data, because:

- (a) we could not identify for Microsoft a [X] discount schedule fit for running our simulated scenarios on customer's incremental demand. This was mainly due to the bespoke nature of CSD negotiation practices adopted by Microsoft;²⁶ and
- (b) the quality of Microsoft's data appears to be generally less reliable, due to several missing values on fundamental CSD characteristics (eg, contract length or actual discount rate).²⁷

U.46 The combination of these factors hinders the possibility of performing a similar analysis to the one performed for AWS' CSDs.

²⁶ Microsoft response to the CMA's information request [X].

²⁷ Total commitment figures were missing on [X] out of [X] total observations in the original data set. Agreed discount rate and length of CSD contract were also missing on several observations.

U.47 At the same time, and despite the generally lower reliability of Microsoft's data, we think it is reasonable to assume that the main conclusions and results obtained from the analysis of AWS' data would be broadly similar if extended to Microsoft's data. This is because:

- (a) notwithstanding the issues with Microsoft's discount schedule described above, the relationship between the discount rate and the commitment in Microsoft's CSDs is broadly similar to AWS';
- (b) there is a range of descriptive statistics from Microsoft's and AWS' CSDs which are fairly similar between the two cloud providers, such as: median commitment, trend in increase in commitment over the years, median and average CSD length, average and median discount rate, share of annual cloud spend represented by customers with a CSD, and median incremental discount and growth in commitment at CSD renewal;²⁸ and
- (c) we note that there are also some differences in some descriptive statistics, eg in the average discount rate for high values of commitment. Overall, we do not consider these differences undermine our view that the main conclusions and results from the analysis of AWS' CSDs would broadly extend to Microsoft's.

²⁸ Responses to information requests [X].