

Unfair Software Licensing Practices:

A quantification of the cost
for cloud customers



Report by

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<https://cispe.cloud/studies/fairsoftware>

CONTENTS

About the Author	2
Executive summary	3
1. There are concrete concerns for unfair and anticompetitive practices impacting the cloud sector	4
1.1 Market characteristics of the cloud sector	7
1.2 Market power in adjacent cloud segments can create the ability and incentives to foreclose	9
1.2.1 <i>Input foreclosure</i>	10
1.2.2 <i>Customer foreclosure</i>	15
1.2.3 <i>Bundling and Tying</i>	17
2. A survey of Cloud Customers confirms the existence of problematic behaviours from Legacy Software Vendors	22
2.1 Methodology of the survey to collect cloud customers' input	23
2.2 Multiple elements show that legacy software providers, such as Microsoft, leverage their position on market segments where they have historical dominance to extract rent on ancillary market segments	25
2.2.1 <i>SQL Server licensing surcharges</i>	26
2.2.2 <i>Restrictions on Office 365 portability</i>	27
2.3 The unfair software licensing practices result in extra costs and reduced performance for cloud customers	30
2.3.1 <i>The first-year extra costs caused by Microsoft's licence repurchasing policy for Office 365 can be estimated at €560m in Europe</i>	30
2.3.2 <i>The total overcharge on SQL Server users who deploy the software on third-party IaaS and cannot enjoy Azure Hybrid Benefit may reach €1bn</i>	33
3. The European Commission and National regulators should urgently assess whether software licencing practices qualify as anti-competitive or unfair illegal practices	41
4 Annex	45

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EXECUTIVE SUMMARY

1. Cloud computing services are taking on an increasingly important role in driving the digital transformation of the European economy. In recent years, as a result of the broad-based adoption of cloud services, the European cloud market has more than quadrupled in size, growing from \$19.91bn in 2016 to \$90.25bn in 2022, a figure which is expected to reach \$187.24bn by 2027.¹ Indeed, the potential for cloud services — as a vector of growth and innovation — has been recognised by the official directives of the European Commission, which reaffirm **the need to ensure access to secure, sustainable and interoperable cloud infrastructure and services** for European businesses.²
2. However, certain empirical facts may point to **concerns regarding the strength of competition in the market**. In particular, the cloud computing market exhibits increasing concentration, with a limited number of players consolidating market share at the detriment of smaller providers. Furthermore, the industry is marked by the presence of vertically integrated providers, whose market power in adjacent, on-premise software segments may give rise to competition concerns.
3. In light of these facts, the objective of the present study is two-fold:
 - Firstly, we seek to establish the economic basis of how the market's existing configuration may create the conditions for the emergence of unfair and anticompetitive practices. For example, we detail how certain legacy software providers may leverage their strong, sometimes dominant, position in adjacent markets (e.g. software) to exclude and foreclose competitors in the cloud infrastructure markets. These actions directly harm customers and limit the ability of non-legacy, or “naked”, providers to compete on a level playing field;
 - Secondly, we provide the building blocks of a quantitative evaluation of the economic harm incurred by customers as a result of these potential abuses. Given that the practices under investigation may result in direct extra costs (e.g. licensing surcharges), in addition to indirect costs (i.e. alternatives foregone), this allows us to build a generalised picture of the cost impact that such actions may impose on cloud customers.
4. To gather elements that substantiate the alleged practices, our study is coupled with material collected from a series of interviews with large cloud customers. On the basis of the information provided, for example, we show that **Microsoft's BYOL policy change in 2019**, which ended users' ability to deploy on-premise Office 365 licences on third-party infrastructure, may have resulted in **first-year licence repurchase costs equivalent to €560m for the European market. An additional overcharge of €1bn**, relating to licensing surcharges imposed on non-Azure deployments of SQL Server, **may further be attributed to the policy change**. These two examples, which one may qualify as a *de facto* tax on cloud customers, form part of a wider set of commercial policies employed by legacy software vendors also offering cloud infrastructure services to exclude competitors and gain share.
5. In this regard, this study acts as a follow-up to our previous study released in 2021,³ in which we detailed how unfair software licensing policies can distort fair and effective competition in the cloud infrastructure space. This report provides further empirical and quantitative evidence to these claims and may serve as further material to competition authorities seeking to address these pressing issues. **Urgent action is needed to restore competitive balance in the market**, which in turn, will **underpin the growth and dynamism of the European cloud services in the coming decades**.

1 Statista (2022), *Europe public cloud market forecast*, available at <https://www.statista.com/outlook/tmo/public-cloud/europe>.

2 European Commission, *Shaping Europe's digital future*, available at <https://digital-strategy.ec.europa.eu/en/policies/cloud-computing>.

3 CISPE, *Cloud Infrastructure Service: An analysis of potentially anti-competitive practices*, October 2021, available at <https://www.fairsoftwarestudy.com>.

1

THERE ARE CONCRETE
CONCERNS FOR UNFAIR AND
ANTICOMPETITIVE PRACTICES
IMPACTING THE CLOUD SECTOR

6. Cloud computing has undergone rapid growth and is becoming a fundamental pillar of digital transformation. Through its promise of delivering elastic, scalable and cost-efficient computing resources, cloud services are increasingly seen as an important driver of growth and innovation, and are gaining widespread adoption amongst business users seeking to transform the way in which they deliver their goods and services. This trajectory is only likely to be accelerated by the secular megatrends transforming the digital economy, such as artificial intelligence, the Internet of Things, blockchain and data analytics.¹
7. The European market itself has been no exception to such trends. In recent years, the European cloud market has more than quadrupled in size, growing from \$19.91bn in 2016 to \$90.25bn in 2022, a figure which is expected to reach \$187.24bn by 2027.² Through a number of official policy objectives, the European Union has furthermore reaffirmed the role of cloud services in shaping Europe's "Digital Decade",³ in which, leading up to the 2030 horizon, cloud computing is seen as a key enabler of the community's digital transformation, economic growth and data sovereignty.
8. In light of its importance as a vector of *growth, transformation and sovereignty*, the safeguarding of the strength and resilience of cloud markets takes on considerable importance. However, an increasing number of elements may point to concerns regarding the contestability of such markets.
9. Specifically, **cloud computing markets demonstrate high, and increasing, levels of concentration**, with a few players controlling substantial shares of the Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) segments. For example, the three hyperscalers (i.e. Amazon, Microsoft and Google) alone control around 83% of the IaaS sector,⁴ with a number of smaller competitors providing fragmented services that offer limited competitive threat to the major players' offerings. Compounded by inherent characteristics of the cloud infrastructure sector, such as significant switching costs and high barriers to entry, this may raise legitimate concerns regarding the long-term strength of competition in the sector.
10. Furthermore, **we observe that certain cloud providers may be able to leverage their strong, sometimes dominant, position in adjacent products to foreclose competing providers in the core cloud market segments**, such as through the imposition of unfair licensing terms on on-premise users seeking to migrate to the cloud. Such actions directly harm customers and limit the ability of non-integrated, "naked" providers to compete on a level playing field.
11. Indeed, the urgent need to create equal competitive conditions in the cloud and ancillary markets has been recognised by regulatory authorities and market participants alike. For instance, the UK communications regulator, Ofcom, recently issued an interim report on cloud services in the UK, in which it addressed Microsoft's software licensing practices and concluded that "*Ofcom and the CMA [UK Competition and Markets Authority] will consider the most appropriate way forward on these issues.*"⁵ As part of their report, Ofcom surveyed a number of European organisations, who widely regard Azure as the *de facto* choice for cloud services due to its close integration with legacy Microsoft software. **Microsoft was described by their customers as "deceptively expensive", "inflexible" with a "tie-in mentality", and was criticised for making customers "pay for products they do not need."**⁶

12. Similarly, the European Commission (hereafter “EC”) is reported to have initiated work on the matter, following a complaint filed in 2021 by three European cloud service organisations (i.e. OVH Cloud, Aruba, Danish Cloud Community), in which Microsoft was accused of abusing its dominance in productivity software to artificially favour its own cloud infrastructure services.⁷ This has been substantiated by further actions by market stakeholders, such as the association of Cloud Infrastructure Service Providers in Europe (CISPE), which sought remedies in 2022 for vendors and customers impacted by Microsoft’s “*unfair software licensing practices*.”⁸ Along similar lines, VOICE, a German association of enterprise cloud customers, had called for action against SAP, accusing the German leader in Enterprise Resource Planning (ERP) software of abusing its market power to coerce users into accepting excessive licensing fees.⁹ In 2021, CIGREF, the association of French CIOs, filed a further complaint against SAP to the French Competition Authority for unfair software licensing practices.¹⁰
13. In this regard, the present study seeks to establish the economic basis for an analysis of such potentially anticompetitive practices by legacy software vendors, and to provide the building blocks for a quantitative evaluation of the harm suffered by users and customers of cloud infrastructure services. In our exchanges with cloud customers, **respondents pointed to two licensing policies as particular points of concern: Microsoft’s (i) Office 365 and (ii) SQL Server, both of which result in significant licensing surcharges if used in conjunction with third-party infrastructure services.** As part of this report, we quantify the degree of the overcharge, and the resulting economic harm for the European economy as a whole.
14. To this end, the report is structured as follows:
- Section II.1 details the market configuration of the cloud and adjacent software markets, and describes how the prevailing market structure, and the existence of certain “mission-critical” software products, may create the conditions for unfair and exclusionary abuses in the cloud infrastructure segments;
 - Section II.2 provides the economic foundations of how “legacy” software players (e.g. Microsoft), through their integrated position across the cloud stack, may leverage their power in adjacent market segments to gain share in core cloud segments. This may be achieved via various means, such as through input and customer foreclosure, bundling and/or self-preferencing;
 - Sections III.1 and III.2 provide empirical substance to these claims, by documenting feedback collected from cloud users as part of an interview series with large enterprise users. This qualitative evidence is substantiated by quantitative elements provided in III.3, which allow to determine the economic harm, and potential price increases, resulting from legacy software vendors’ actions;
 - Section IV concludes with a call for action to restore competitive balance in the cloud computing market. There is a pressing need to adapt existing legal instruments and to enforce prohibitive measures against such unfair licensing practices. This, it is argued, will be critical in safeguarding the growth and contestability of the European digital services in the long term.

1.1 MARKET CHARACTERISTICS OF THE CLOUD SECTOR

15. Cloud computing is a distributed model of computing in which users access a network of shared and configurable computing resources via the Internet. These resources can be accessed on-demand, typically on a “pay-as-you-go” basis and consist in the outsourcing of physical hardware and/or software resources onto the infrastructure of a dedicated provider. In doing so, cloud users avoid the capital expenditure and complexity involved in the day-to-day management of physical servers and/or applications and are instead able to focus on front-end operations and the optimisation of the customer experience.
16. The development of the cloud servicing model comes, notably, in lieu of more traditional modes of IT administration, which rely on private infrastructure typically deployed “on-premise”. These systems present constraints not found in the cloud, insofar that users have to contend with pre-defined capacity, on-site servers and a highly localised system of resource administration. In this regard, the cloud servicing model may present significant economic benefits to users, such as elasticity, scalability and ease of access — factors that have been attributed as key drivers of its rapid adoption.
17. In practice, the scope of the offerings within cloud services is varied, ranging from essential infrastructural capabilities to ready-to-use applications. These can be characterised in terms of three main service models, each of which corresponds to a specific set of functions and use cases within the computing stack:
 - **Infrastructure as a Service (“IaaS”): Providers supply essential computing capacities** — i.e. infrastructure — to their customers. The main resource types involved are computing, networking, storage, each of which can be consumed as an individual service component, or in bundles (e.g. computing and storage). In choosing from the list of available resources, IaaS customers exercise control over their virtualised infrastructure, and can configure the resources as needed for their applications and workloads. Examples include AWS’ Elastic Compute Cloud (EC2), Microsoft’s Azure Dedicated Host and Google Compute Engine (GCE).
 - **Platform as a Service (“PaaS”):** This refers to a specialised platform for customers to develop, run and manage applications without the need to build and maintain the underlying infrastructure. The tools within the platform stack, which are designed to streamline programming and to reduce complexity, include middleware, development tools, database management systems and other utilities. Some examples are Google Cloud Run and Azure’s SQL database. Whilst the former allows developers to write code in their preferred programming language, the latter allows users to query data without the need to worry about capacity, backups and updates.
 - **Software as a Service (“SaaS”):** A complete software solution that can be purchased on a pay-as-you-go basis. Under this model, the customer licences the use of an application for its organisation, typically on a recurring subscription basis, and accesses the resource through a web browser. As the application layer of the cloud, all the underlying infrastructure, middleware and application software providers are hosted and maintained by the service provider. Examples include Microsoft Office 365, Salesforce’s Customer 360 Platform and SAP’s HANA Cloud.

- 18.** Whilst it is possible to recur to each of these service offerings in isolation, it is in practice common to use these offerings in complement of each other. Depending on a customer's needs, one may tailor and adapt its service mix, choosing components across service models and between different providers. For example, a software developer could opt for a specific cloud provider in its day-to-day business operations (e.g. accounting, CRM, productivity software), whilst recurring to another cloud provider for the hosting of its customer facing applications (e.g. software interfaces, web applications). In some cases, there may even be a perfect degree of complementarity between two product offerings: for example, a virtual machine may not be usable without an operating system, just as a database may be obsolete in the absence of a query language.
- 19.** Insofar that customers may overlay different services along the "vertical" chain of cloud services, which extends from core infrastructure to consumer-facing applications, cloud markets may be said to exhibit vertical integration. In such markets, a provider operates simultaneously in the upstream and downstream segments, catering to customers' different demands along the production chain. However, given that these legacy players enter into competition with other players' offerings at varying points of the vertical chain — either as an input provider to downstream competitors, or as a customer to the outputs of competitors — this confers a degree of influence on the price and supply conditions in connected market segments.
- 20.** Indeed, evidence points to a gradual downstream shift by traditional IaaS providers, and in certain cases, an upstream shift by legacy software providers. For example, whilst AWS initially supplied their computing and storage capacities (i.e. IaaS), by 2011, it had made entry into the PaaS space via AWS Elastic Beanstalk, and subsequently began to develop its own SaaS offerings. Conversely, Microsoft, a dominant player in the software segment, initially began servicing the upstream market via PaaS, and gradually expanded into IaaS. These structural market characteristics have the potential to give rise to vertical competition concerns.
- 21.** In addition to these "core" cloud market segments, customers also typically need to consider the availability of complementary, or "adjacent", services when choosing their cloud providers. These consist primarily of software components, such as productivity software and operating/database management systems, which can either be purchased through integrated PaaS or SaaS solutions, or bought separately and integrated with existing cloud infrastructure. In many cases, these adjacent products may initially have been acquired as part of an "on-premise" licensing arrangement, which customers subsequently seek to deploy within a cloud environment following their cloud migration.
- 22.** Some of these software may be considered as "mission-critical" to end users, required for the smooth and efficient execution of infrastructure-based tasks. In such cases, non-integrated providers would have to sub-license the use of the additional software, often as part of special licensing agreements, from integrated players. In doing so, however, this may leave them vulnerable to asymmetric licensing policies or unfair terms of use.

- 23.** In some examples of the problematic practices adopted by certain legacy software vendors, **we received feedback that, in selecting Microsoft’s flagship productivity software Office 365, customers are forced into paying an additional licensing fee if they choose a third-party cloud infrastructure provider instead of Microsoft’s in-house offering, Azure.** Such a policy, by raising rivals’ costs of doing business, can limit customers’ freedom in mixing cloud solutions based on price and qualitative considerations. In addition, **Microsoft was noted to take steps to optimise, or even tie, its legacy software products and nascent cloud services together. For instance, Office products are closely integrated with Azure’s ancillary solutions:** together, these form “*a network of self-reinforcing pathways*” that serve to increase the complementarity of the services as a whole (i.e. Active Directory, OneDrive, Teams).¹¹
- 24.** In light of these relationships, vertically and horizontally (i.e. through adjacent segments), an examination of the overarching market configuration, and the level of concentration within each relevant market segment, becomes a crucial element in understanding the competitive dynamics of the sector. Providers who possess high market shares in non-cloud market segments may be able to leverage their dominance in adjacent software into the wider market for cloud services, and foreclose competitors’ access to critical inputs. The following section provides the economic intuition behind such practices and distils them into a number of stylised examples; this, in turn, provides the basis for the ensuing analyses of this report.

1.2 MARKET POWER IN ADJACENT CLOUD SEGMENTS CAN CREATE THE ABILITY AND INCENTIVES TO FORECLOSE

- 25.** As highlighted, cloud computing can be characterised as a variety of specialised services, ranging from the provision of basic cloud infrastructure (i.e. IaaS) to platform and application-based cloud solutions (i.e. PaaS/SaaS). Additionally, many customers require a wide range of complementary IT services or software that may be offered by the cloud services providers themselves (i.e. adjacent software). The strong connection between cloud computing services and complementary products means that, in choosing a cloud services provider, users must also typically consider the availability, level of integration and cost of adjacent software components.
- 26.** Over time, **a number of legacy software providers with substantial market power in adjacent market segments, especially mission-critical software, began to offer cloud services.** These players enjoy durable and entrenched positions in essential software products, e.g. database management and productivity software, tools characterised by their deep embedment in the IT enterprise workflow and a low level of substitutability. This translates, in turn, into an ability to act as a gatekeeper into other services within the cloud stack — as controllers of the conditions of access.
- 27.** This may notably be the case of legacy software providers, some of whom were forced to engage in a rapid transformation of their licensing-based business models to make gains in the cloud computing sector. As the owners of the dominant customer-facing applications — forced to play catch-up in the “cloud arms race”¹² — these players can, and may have the incentive to, leverage their power in adjacent market segments into the cloud infrastructure space.

- 28.** Furthermore, such providers may also benefit from their existing enterprise agreements, as well as established distribution channels, to gain an advantage in commercial negotiations. This may be particularly relevant for the substantial cohort of non-digital natives: users who have legacy, on-premise IT infrastructure seeking to “lift-and-shift” their applications onto the cloud. By imposing restrictions, for example, on the portability of on-premise licences onto third-party infrastructure, **legacy software providers can severely limit the ability of non-integrated players to compete on a level playing field.**
- 29.** This issue may be particularly relevant, given that many enterprises and SMEs have yet to migrate fully to the cloud. IT customers decide on their cloud providers as a function of their overall preferences and needs, and on-premise remains the predominant mode of cloud deployment. For instance, a recent Gartner report estimated that around 30% of new IT workloads in 2021 were deployed on the cloud, a figure which is expected to increase to over 90% by 2025.¹³ In light of these exponential trends, cloud adoption is at a critical juncture, and any **cross-dependencies between market segments may deprive users of choice** in configuring the mix of infrastructure and adjacent software solutions that best fit their long-term needs.
- 30.** Taken as a whole, these practices, consisting in denying fair and equitable market access to competitors, can be described in economic terms as foreclosure. This concept can be further segmented into two scenarios — input and customer foreclosure — relating to cases when dominant players limit their competitors’ access to their products as inputs or to their customers, respectively. These practices, and their relevance to the cloud computing context, are described individually in what follows.

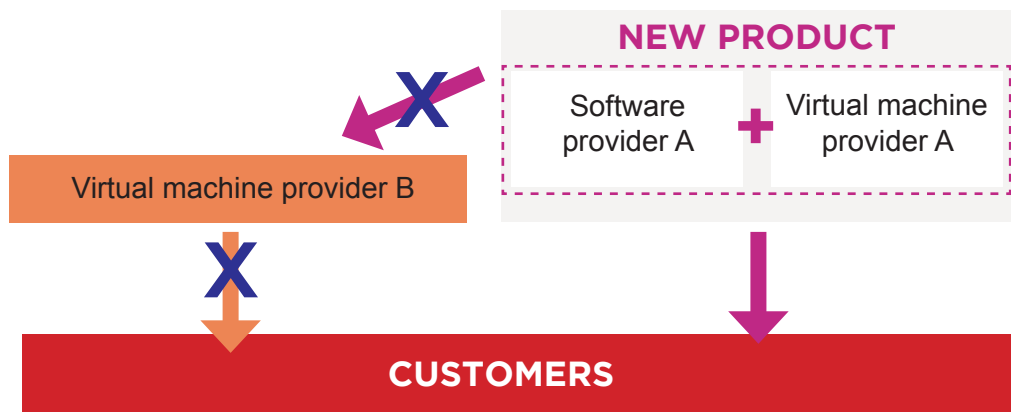
1.2.1 Input foreclosure

- 31.** Input foreclosure refers to situations in which an upstream player restricts access of critical inputs, produced by the upstream company itself, to downstream competitors. This is an important consideration in the assessment of vertically-integrated markets, as well as non-horizontal mergers, given that such behaviour can lead to reduced competition, innovation and higher prices for end consumers in the long term.
- 32.** By engaging in input foreclosure, upstream players with substantial market power over a certain crucial input can change the ability, and incentive, for downstream competitors and potential entrants to compete effectively. Downstream competitors may find themselves effectively locked out of the market, unable to obtain the necessary inputs for the production of their goods.
- 33.** In practice, there are several means by which input foreclosure can be achieved:
- The upstream input producer may refuse to supply, or grant less favourable access conditions to, the downstream party. For example, the vertically-integrated firm may increase input prices to rivals, thereby raising their costs, whilst continuing to supply its downstream entity at or below marginal cost. This prevents or limits the ability of competitors to compete on price;

- The upstream player may implement technologies that are poorly compatible with rivals' technologies, or refuse to grant licences giving access to the foregoing;
- The upstream player may deliberately degrade the quality of the input supplied to third parties.

34. It is of note that all these considerations are directly relevant to cloud services, given that software providers have, at once, the ability to change access conditions (e.g. via terms of use, pricing), the interoperability of solutions, as well as the level of optimisation of the software solution vis-à-vis the third-party infrastructure. Additionally, some of these changes may happen very rapidly. For instance, a software supplier could make its product incompatible with third-party virtual machines overnight, by releasing a new update designed to reduce interoperability. This provides reasonable grounds to consider input foreclosure as a key competitive concern in such markets.

Figure 1: Stylised example of Input Foreclosure



35. In evaluating the likelihood of a scenario involving input foreclosure, the EC relies on several key criteria. As per its *Guidelines on the assessment of non-horizontal mergers under the Council Regulation*,¹⁴ it notes that the authority examines:

- As a first criterion, whether the vertically-integrated entity possesses the *ability to substantively foreclose access to inputs*. In this regard, only players with significant market power, and the ability to translate this power into influence on the price and supply conditions in the downstream markets, can be considered as of relevance.
- As a second criterion, the Commission assesses whether the integrated entity has the incentive to foreclose. In other words, it should be demonstrable that foreclosure can be expected to yield a profitable outcome. There are two axes on which such an assessment can be made: (i) a vertical trade-off, pertaining to the ability of the vertically-integrated firm to make up for the profit lost in the upstream market due to the restriction in input sales to rivals, through increased profits in the downstream market; and (ii) a dynamic trade-off, which weighs potential short term losses in sales against longer term gains in rent or market share.

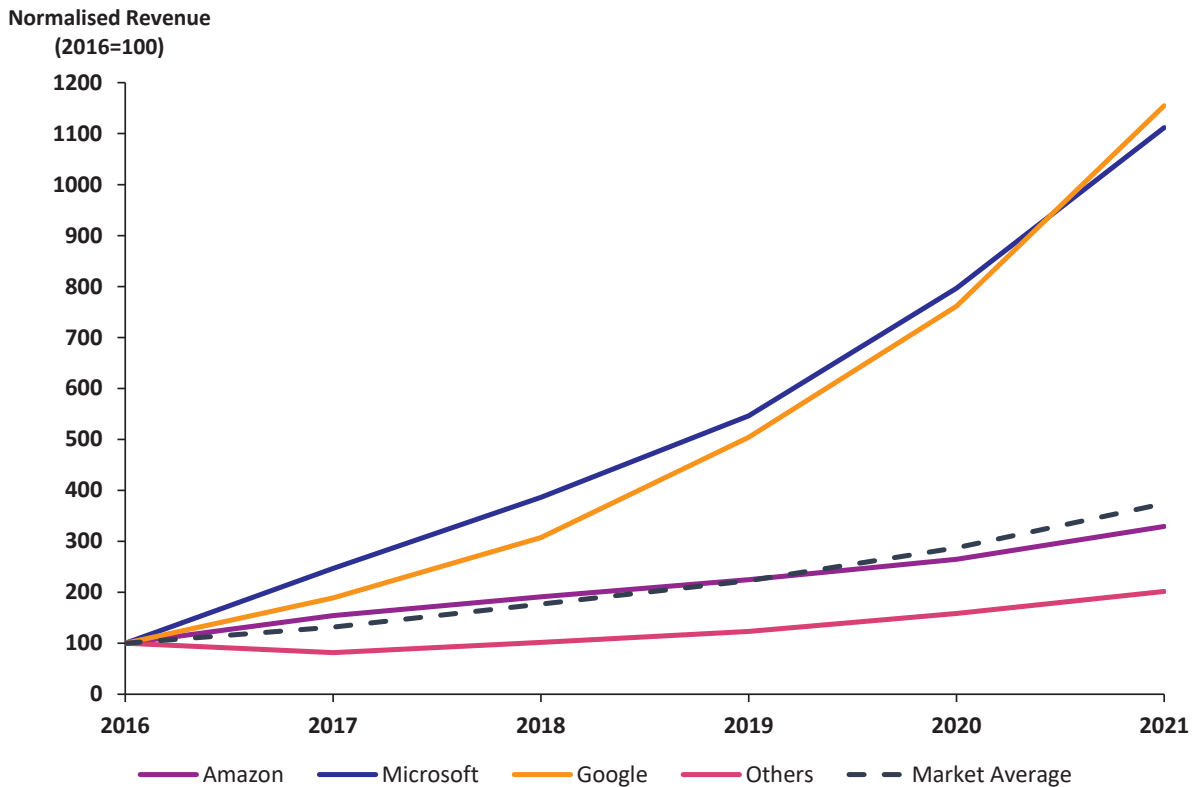
- *The third and final criterion pertains to the effect of foreclosure on competition downstream. Specifically, foreclosure should be demonstrated to adversely impact effective competition in the downstream market, such as through increased prices for consumers, or by limiting the equilibrium number of competitors.*

1.2.1.1 Input foreclosure within the cloud computing context

- 36.** In light of these considerations, it becomes clear that certain large, legacy software vendors may fit within the framework defined above. Specifically, on the basis of the three-part assessment criteria described — consisting of the ability, incentive and impacts to foreclosure — it is possible to show that certain behaviours employed by software vendors fit squarely into the scope of such abuses.
- 37.** To analyse the case of input foreclosure, Microsoft’s “Bring Your Own Licence” (BYOL) policy may provide an instructive example.¹⁵ Under the arrangement, prior to 2019, users who purchased Office 365 or SQL Server licences were able to freely deploy the software on their own on-premise infrastructure, in addition to outsourcing these licences onto hardware leased from and managed “Listed Providers”, i.e. AWS, Google and Alibaba, all of whom offer dedicated cloud infrastructure services.
- 38.** However, the licensing terms, which had up to the point allowed Microsoft software customers to freely migrate their activities to the cloud, came to an abrupt end in October 2019 when Microsoft launched its new infrastructure service, Azure Dedicated Host. Under the new rules, customers choosing to deploy their software on third-party infrastructure would be forced to repurchase their licences. This therefore translates into a direct increase in the final prices of competitors’ offerings, whilst maintaining Microsoft Azure in a relative (albeit artificial) competitive advantage.
- 39.** Indeed, the seamless use of Microsoft enterprise software, and its comparative cost advantages, is portrayed as a centrepiece of the Azure ecosystem. Under what it defines as the Azure Hybrid Benefit, Microsoft itself notes that AWS is five times more expensive than Azure for Windows and SQL Server, and that “*other cloud service providers may claim to have similar savings to the Azure Hybrid Benefit, but you will need repurchase your Windows Server licence on those clouds.*”¹⁶
- 40.** This *ability* to leverage its strong position in adjacent software segments, to impact the price and supply conditions in the cloud computing segments, has been attributed as a key driver of the rapid market share growth achieved by Azure since its inception. Notably, Microsoft controls 76% of the Desktop OS market, over 90% of the office productivity software market, in addition to being the default choice for customers of other enterprise solutions.¹⁷ As per our conversations with cloud customers, Microsoft’s share in office productivity software, in particular, underscores its dominance on the “enterprise” side of the market — especially as regards Desktop/PC segments — where Google’s G Suite offering has more limited reach.¹⁸ The lack of a viable alternative translates into significant market power, which it leverages to exercise control over enterprises’ choices in the cloud migration process.

41. As pertains to Microsoft's *incentive* to foreclose competitors, in the case of BYOL, it is of note that the asymmetric nature of the policy means that Microsoft incurs no extra costs, nor does it risk potential loss in revenue given limited demand and supply substitutability for its products. Furthermore, Microsoft may be able to increase prices on its infrastructure services (i.e. Azure Dedicated Host) — to the extent that such an increase is less than the price increase imposed on rivals — thereby allowing it to extract additional rent without creating the incentives for customers to deploy their licences elsewhere.
42. From a dynamic standpoint, given the size of cloud computing's Total Addressable Market ("TAM"), it may also be profitable for Microsoft to sacrifice short term profit maximisation in favour of long-term gains in market share. The nascency of the market, and the long runway of growth that lies ahead, mean that cloud computing's importance to the incremental growth of large established technology players cannot be understated. As an article by the Economist notes, in referring to Microsoft CEO Satya Nadella's decision to make the Azure Intelligent Cloud one of the company's strategic priorities, "*Microsoft cannot afford to get Azure wrong. It is what drives its share price.*"¹⁹ This asymmetry may furthermore be accentuated by the substantial switching costs inherent to the cloud servicing model: given the trade-off between short term profits, and on the other hand, the lifetime value of a cloud customer, service providers have the incentive to fight tooth-and-nail to expand market share early into the cloud market's development.
43. Finally, as to the likely impact of such practices on effective competition, this can be decomposed into two effects:
- Firstly, in terms of pricing outcomes, it may be noted that cloud services are typically delivered on a consumption basis, which entail variable rather than fixed costs for cloud users. As a result, any increase in the input costs to competitors, such as through the service fees charged to Microsoft partners who provision licences as part of a Service Provider Licence Agreement (SPLA), are likely to be directly reperculated onto the final prices borne by end consumers;
 - Secondly, as relates to market composition, it may be observed that subsequent to its late entry into the IaaS market, Azure has achieved rapid share gains, at a sector-leading rate of 62% per annum.²⁰ Notably, this growth has come largely at the expense of smaller providers, who have underperformed the market's overall expansion (23%), and whose cloud revenue has stagnated in absolute terms. As a result, the sector has witnessed a progressive recomposition from a multi-polar competitive state, to one of increasing consolidation around the three large cloud providers (AWS, Azure, GCP).²¹

Figure 2: Normalised IaaS Revenue



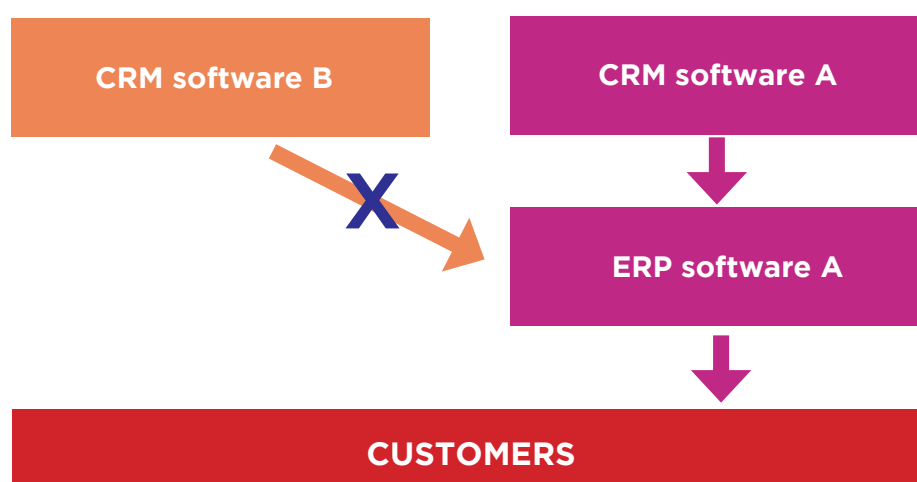
Source: Statista, Vendor share from the public cloud services IaaS market worldwide 2015-2021

- 44.** In light of this tendency of increased concentration, there are further competitive risks to be considered in the longer term. For example, once the cloud market reaches maturity, the incremental return on capital will diminish, which may turn the providers' focus onto profitability. At this point, the players may cease to compete on price, reduce capital expenditures and leverage their market power to maximise rents. These adverse effects can be more potent if there is a limited number of competitors and if vendor lock-in is prevalent in the market.
- 45.** Some early effects of maturity, such as customers' better understanding of how to optimise their spending on cloud computing, already manifest themselves. As a result, providers now seek to strike longer term contracts with their customers, perhaps partly in view to lock-in expected future rent, and to convince them to adopt a wider variety of their services. Microsoft, specifically, made additional steps to tie its cloud products — including Azure, Microsoft 365 and Dynamics — even more closely together. Despite the growing awareness of customers in using cloud computing services, experts do not see any major sign of intensifying competition in this market.²²

1.2.2 Customer foreclosure

- 46.** Customer foreclosure, on the other hand, refers to situations in which the downstream entity of a vertically-integrated firm exclusively purchases inputs from its upstream division, thereby foreclosing rivals' access to the customer base. Within the cloud computing context, this may occur if a service provider, especially one that controls a computing environment, prevents the interoperability of third-party services into its ecosystem of products, thereby restricting the access of rival cloud vendors to its customers.
- 47.** The assessment of the likelihood of customer foreclosure proceeds on much of the same basis as input foreclosure: it is important to evaluate the ability and incentive of the integrated entity to foreclose, in addition to the likely competitive effects.
- 48.** Furthermore, the EC notes in its guidelines on non-horizontal mergers that customer foreclosure is only credible if the downstream market is conducive to the exercise of market power, such as through the control of access to end users. Thus, a careful analysis of the distribution channels, as well as the ways product are sold into the downstream market, is paramount.

Figure 3: Stylised example of Customer Foreclosure



1.2.2.1 Customer foreclosure within the cloud computing context

- 49.** As relates to cloud computing, customer foreclosure may be particularly concerning if providers own access to a dominant ecosystem of products downstream. This may be illustrated, for example, through the case of SAP's "Indirect Access" policy. Indirect Access requires the payment of licence surcharges when data generated through the SAP ecosystem is accessed by non-licensed users, typically through an application-to-application interface — e.g. when a consumer places an order in SAP ERP via a non-SAP online storefront. Notably, users may not even be aware that SAP-generated data is accessed, given that they normally access SAP workflows through an intermediary system.²³

- 50.** By forcing these users (specifically, suppliers in direct contractual relationship with SAP) to pay an additional licence fee, SAP effectively increases the price of access to its customer base for third-party software. Therefore, rival providers offering complementary software may not be able to profitably service SAP's customers, which in turn, may leave them as potential customers for SAP's own competing software solutions. Indeed, SAP had acquired several start-ups in preceding years that complement its existing services and accelerate its integration to the cloud, such as Concur (travel booking tool), SuccessFactors (human resources platform) and Signavio (a business process intelligence start-up specialised in supply chain optimisation).²⁴ Additionally, SAP launched its new platform suite offering robotic process automation and AI, which enhanced its move to the cloud and, presumably, allowed it to substitute the role of its foreclosed software-provider rivals.²⁵
- 51.** While SAP directly increases the cost of access to its customer base for rival third-party software providers via potentially exclusionary licensing, an additional means by which an integrated provider may exercise customer foreclosure is via self-preferencing, which pertains to the concession of preferential treatment to one's own products or services.
- 52.** An example of this may be the linkage of Office 365, the default productivity suite of enterprise users, with OneDrive, Microsoft's in-house cloud storage system. Specifically, the incumbent may leverage its strong position in productivity software to prevent competing cloud storage providers from accessing its users, such as by making One Drive the default cloud storage service for Office 365 users, or furthermore, by allowing autosave on Office 365 exclusively through One Drive. In offering One Drive as the default service within the Azure ecosystem — and making it a seamlessly integrated component of a package of other Microsoft services — customers may choose to avoid the extra costs entailed by mixed cloud solutions, thereby restricting the customer base on which rivals (e.g. Dropbox, Google Drive) can compete.
- 53.** Besides having the ability to foreclose its downstream customer base, Microsoft also appears to have the incentive to commit itself to this measure. For instance, Microsoft's operating system, Windows, enjoys a near monopolistic position on the market of operating systems.²⁶ Therefore, even if customers using Windows were dissatisfied by the additional services provided by Microsoft and found themselves limited in substituting for these services, they would have little choice of alternative OS providers. Consequently, this low substitutability provides ample incentive for Microsoft to restrict the access of rival companies to Windows users.
- 54.** The concerns regarding the consequences of customer foreclosure are shared by Microsoft's users. For instance, on Microsoft's FAQ page one user complaint asks “[i]n Word (Office 365 version) I used to be able to autosave locally to the PC instead of to OneDrive. Now I am being forced to save to OneDrive if I want the Autosave feature turned on in Word. But I'd rather not use OneDrive since I already have Google Drive, and it is not necessary to use both (in fact they seem incompatible as far as I can tell as OneDrive started clobbering my Google Drive folder locations when I tried to install it).”²⁷

1.2.3 Bundling and Tying

- 55.** In addition to foreclosure, a third way in which a provider with strong market position may harm competition in adjacent market segments is through the bundling or tying of services. In its general form, bundling refers to the practice of offering several products, normally sold separately, together as part of a package. For example, an integrated cloud provider may decide to offer its in-demand collaboration tool, sold normally only on adjacent market segments, within a wider bundle of complementary services. In most scenarios, as is the case in mixed bundling, the cost of purchasing the goods in a bundle is lower compared to the total costs of buying each component individually.
- 56.** It follows that one of the competitive concerns regarding mixed bundling is that a firm, through its presence on one or more adjacent market segments, may be able to gain an unfair competitive advantage by offering its services at a total price lower than what would have been possible in separate markets. In this regard, naked cloud infrastructure providers, who have to license this tool externally, may be put in a relative competitive disadvantage, as they do not service across the full stack of cloud and adjacent software segments. Such markets can be said to be susceptible to conglomerate effects, insofar that a multiproduct firm demonstrates an ability to exercise its power across multiple market segments.
- 57.** It may be noted, additionally, that these effects can be particularly acute in cases where the incumbent firm possesses different margin structures across markets, given that the incumbent may cross-subsidise its own offerings, i.e. taking the profits earned in the more lucrative market to offset its losses in the less profitable one, and to undercut its competition over the short or medium term. Indeed, given the high level of profits and cash flow generated by its legacy software business — Microsoft generated \$63.4bn dollars in productivity and business software sales alone in 2022²⁸ — the legacy provider may have ample room to offer preferential pricing conditions to customers who choose to migrate to Azure.
- 58.** An alternative to mixed bundling is tying. Tying occurs when a seller agrees to sell or lease a product or service only if the customer agrees to purchase another given product or service, a constraint which may be imposed via contractual or technological requirements. Whilst the means through which tying is implemented differs from mixed bundling — tying does not necessarily specify fixed proportions in which the two goods need to be purchased — the competitive content is similar: i.e. it can be used by a multiproduct firm to deter entry of potential single product firms or force rivals to exit.
- 59.** As pertains to cloud computing, tying may be achieved by integrated services providers contractually specifying that their software must be run on their own cloud infrastructure, or alternatively, engineering their software such that it works more smoothly on their own cloud infrastructure. For instance, an integrated provider may optimise its software to work on their own cloud infrastructure, or to perform poorly on competing cloud infrastructure. Whilst, in principle, the underlying software may be deployed on any cloud infrastructure, its effective use would *de facto* be limited to own-brand cloud infrastructure.

1.2.3.1 Mixed bundling and tying within the cloud computing context

- 60.** A recent example of tying in the cloud services sector can be illustrated by Microsoft’s decision to tie its Teams products with the other offerings of the Office 365 suite. By providing the former practically free of charge, in addition to imposing its automatic installation within the Office bundle and refusing its purchase on a standalone basis, Microsoft is able to exclude competing collaboration software providers from offering their services as a viable alternative. Indeed, in a complaint filed with the EC in 2020, Microsoft was accused by Slack, a rival collaboration software provider, to have abused its market dominance to “*extinguish competition in breach of European Union competition law.*”²⁹ Furthermore, in “*illegally*” tying its Team product with its dominant Office suite, Slack noted that this move illustrated Microsoft’s reversion to its abusive behaviours of the past.³⁰
- 61.** It is noteworthy that, in an attempt to allay regulatory concerns and to stave off a potential EC antitrust investigation, Microsoft recently offered to begin charging users a service fee for its Teams product.³¹ As part of the policy change, the vendor proposed to charge differentiated prices for different combinations of Office product suites – and without the automatic tying of Teams within the bundle. Whilst this begins to lay the foundations for the levelling of competitive conditions, it is important to note that Slack’s ability to meaningfully contest Microsoft’s services may have been permanently handicapped, with the market already to a large extent captured.³²
- 62.** Another way in which tying may manifest itself in the cloud computing markets is through the exclusion of aftermarket service providers. An example may be Oracle’s “Matching Service Levels” policy,³³ in which it implicitly ties its licences to maintenance contracts and prohibits end users from mixing licences with an active support maintenance with those without one. As a result, if an end-user bought 10 Processor Licences of Oracle Database Enterprise Edition and 25 Named User Plus Partitioning Licences separately, users would be faced with the following ultimatum: either (i) both Oracle Database Enterprise Edition and Partitioning Licences must benefit from an active support maintenance contract, or (ii) neither can have the maintenance contracts. Additionally, it may be noted that if a user decides to end support maintenance, they will not be entitled to receive software updates, thereby restricting the user to the latest software iteration purchased.³⁴
- 63.** Through such actions, Oracle not only compels users to source the entirety of the maintenance contracts internally – to the detriment of third-party aftermarket providers – but also increases the switching cost for customers seeking to outsource a part or the whole of their maintenance contract with competitors. Under such a scenario, users with an existing part of their maintenance contract with Oracle (e.g. Oracle might provide after sales maintenance free of charge as part of certain licences), and who seek to complement this with a third-party’s services, would have to terminate all existing Oracle licences provisioned as part of the same licence set, and to forego any potential software updates. In this regard, threatened to see their initial investment become obsolete, clients have a strong incentive to rule out third-party maintenance providers in favour of Oracle’s in-house solution.

64. It is important to note that, whilst tying is traditionally regarded as a practice of concern, the competitive effects of mixed bundling may not be so clear-cut. As highlighted by Motta (2004), bundling is not considered *per se* as an anticompetitive practice, given that bundled discounts are often synonymous with price efficiencies and thereby may result in net welfare gains for consumers.³⁵ Indeed, the potential for pro-competitive effects may be credible in the context of traditional markets, given that the transaction of goods occurs as singular, isolated actions with limited temporality. However, the same may not necessarily be said in the cloud computing context. Specifically, given the significant barriers to migration and switching costs that exist in cloud services, multiproduct firms may choose to offer bundled packages as a means to lock in customers, in knowledge of the fact that the short-term profits foregone will be compensated by the long-term rent extracted from captive customers.

Endnotes

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2

**A SURVEY OF CLOUD CUSTOMERS
CONFIRMS THE EXISTENCE OF
PROBLEMATIC BEHAVIOURS FROM
LEGACY SOFTWARE VENDORS**

- 65.** In order to ascertain the potential existence of anticompetitive abuses in the cloud market, and to collect concrete evidence of the economic harm suffered as a result of legacy vendors' practices, we organised a series of interviews with cloud users.
- 66.** The interview process was centred on large enterprise customers, typically publicly-traded companies, with substantial footprints on the cloud. In addition to being large customers of cloud services, these users benefit from the experience of having migrated legacy, on-premise IT infrastructure onto the cloud. This may provide important insight into the unfair commercial policies enacted by legacy software vendors during contract negotiations, or abusive practices intended to foreclose lesser-integrated players.
- 67.** To substantiate claims of the alleged practices, respondents were asked to detail their working relationship with cloud providers and to signal any unfair or anticompetitive behaviour that they may have encountered. Furthermore, to the extent possible, users were also requested to provide quantitative estimates of the extra costs incurred. These may relate both to direct costs, such as licensing surcharges or hidden fees exacted, as well as indirect costs, such as the expected savings had the user been able to freely decide between cloud service providers.
- 68.** The combination of these elements, qualitative and quantitative, provided important insight into the individual cost impact that these potential abuses may have on end customers. In particular, respondents noted significant licensing overcharges relating to Microsoft's BYOL policy, which affected users of Office 365 and SQL Server choosing to deploy their on-premise licences on the cloud. By taking these overcharges as inputs, and extrapolating them onto the industry level, we are in turn able to estimate the economic harm incurred by the industry as a whole. Details relating to these estimates, for Office 365 and SQL Server users respectively, are documented as part of Section III.3.

2.1 METHODOLOGY OF THE SURVEY TO COLLECT CLOUD CUSTOMERS' INPUT

- 69.** In our information gathering process, participants were first invited to respond to a survey, following which an interview would be performed. The survey document contained a set of detailed, quantitative questions designed to evaluate the surcharges incurred by cloud customers as a result of cloud providers' abuses.
- 70.** In order to obtain precise, and where possible, granular estimates of these extra costs, the survey was structured across the overarching lines of (i) abusive and (ii) anticompetitive practices, followed by further segmentations by practice type (e.g. bundling, licensing, switching costs, etc.). Abusive practices mostly concern conditions that are imposed on end customers, such as supra-competitive prices or unfair commercial terms; anticompetitive practices, on the other hand, directly concern the provider's competitors, such as through foreclosure or bundling.
- 71.** The following section presents some examples of the questions raised to survey respondents:

- Were you offered a bundle of cloud-related services, combining both infrastructure services with other software applications (i.e. Productivity, CRM, ERP, Databases, etc.) in a way that meant the cost of those bundles ruled out other similar (or better, or cheaper) unbundled applications and/or cloud infrastructure providers?
- Can you provide an estimation of the costs associated with cloud migration, either in absolute terms or a percentage of your annual cloud spend? This may include fees levied by the provider, in addition to internal costs relating to application refactoring, retraining and/or IT support.
- Have you incurred charges resulting from abrupt or unilateral changes to terms and conditions (e.g. fees, licensing surcharges, additional licence requirements) If so, can you provide us with an estimate of these charges?

72. On the basis of the responses provided, respondents were subsequently invited to the interview stage, in which they could further expand on the issues highlighted, as well as to reveal any additional behaviours that may have fallen beyond the scope of the initial survey. In cases where interviewees did not prepare formal responses to the survey, these were performed on an ad-hoc basis, with the survey questions serving as general guidelines.

73. The respondents spoke on the condition of anonymity, as users are not authorised to discuss contractual and licensing details publicly. Some noted, furthermore, the strong fear of retaliation from legacy software vendors. These measures, designed to intimidate and enact compliance from users, often signify that cloud customers passively submit to providers' policies over the lifetime of a contract lifecycle. One respondent noted, for example, that Microsoft had threatened him and his colleagues with immediate legal repercussions, following public remarks made by the individual in relation to the vendor's licensing policies. This remark was echoed by another respondent, who described the cloud industry, and the dominant providers that constitute it, as "*close to what you have in organised crime scenes.*"

74. As such, in many regards, the interview process represented a rare confidential forum in which cloud customers could speak freely and share details of their experiences dealing with legacy software vendors. Free from the threat of reprisal, participants shared important elements that not only go to substantiate the alleged claims, but additionally, reveal details that accentuate the severity of the unfair software licensing practices under investigation by the EC. These are described in further detail below.

"We are dealing with a market that is very close to what you have in organised crime scenes, to the point where you are risking your career if you say something."

2.2 MULTIPLE ELEMENTS SHOW THAT LEGACY SOFTWARE PROVIDERS, SUCH AS MICROSOFT, LEVERAGE THEIR POSITION ON MARKET SEGMENTS WHERE THEY HAVE HISTORICAL DOMINANCE TO EXTRACT RENT ON ANCILLARY MARKET SEGMENTS

- 75.** Our exchanges with large cloud customers confirmed the existence of behaviours that may raise concerns regarding the state of competition in the cloud computing sector. In particular, legacy software providers were noted to leverage their dominant position in adjacent market segments to impose unfair licensing conditions in the cloud infrastructure segments. These actions are specifically intended to establish the vendor’s initial position within the cloud segment of target, upon which it may leverage its bargaining power and its complementary product offering to further consolidate market share across connected market segments, especially infrastructure services.
- 76. Respondents note, in particular, Microsoft’s use of its control over the enterprise software market, which includes products such as Office 365 and SQL Server, to reinforce and drive growth of Azure.** For example, by creating licensing restrictions around its products (Office 365 or SQL Server) towards competitors’ cloud infrastructure, or alternatively, by creating asymmetric benefits back towards Azure, Microsoft was described to leverage its software as a “*gateway*” into Azure for on-premise users migrating to the cloud.
- 77.** Once a customer has stepped foot within Azure, however, this opens the way for the provider to engage in measures to further expand the user’s cloud footprint: for instance, through the cross-selling of additional services (e.g. bundling), or the optimisation of the performance of its core product offering vis-à-vis other products within its portfolio (e.g. tying). As such, the user, having been drawn into the ecosystem by a given mission-critical product, may find himself in a *snowball effect*, acquiring more & more products and gradually becoming entrenched within Azure and Microsoft’s products at large.
- 78. The dependency on Microsoft products can be such that certain respondents characterise the relationship with the software and cloud provider as a “*marriage*”, from which it is extremely difficult to create conditions of escape.** In many cases, even though customers had received more attractive offers from competing cloud providers — both in terms of performance and pricing — they ultimately continued to recur to Microsoft’s cloud infrastructure services, as only the latter guarantees that users remain compliant with the vendor’s licensing terms. In doing so, however, this leaves customers further captive to Microsoft’s policies, **a relationship which only deepens with time as switching costs increase.**
- 79.** The scope of the policies employed by certain legacy software vendors, whether by means of unfair software licensing or the bundling of core product offerings with ancillary cloud services, are explored individually in the ensuing sections. Furthermore, we also examine the changes implemented by Microsoft to its BYOL licensing terms in October 2022, as to assess the likely impact this may have on effective competition in the market.

2.2.1 SQL Server licensing surcharges

80. In our discussions with cloud customers, several respondents pointed to the licensing of SQL Server as a key point of concern. Specifically, Microsoft was noted to (i) force customers with existing on-premise licences to repurchase their licences, in order to be deployed on the cloud, and (ii) impose licensing surcharges on the software when used within a third-party cloud infrastructure. The combination of these factors results in SQL Server being substantially more costly to run on third-party infrastructure services than on Microsoft Azure.

81. Taken as a whole, **these licensing terms can result in a relative price increase of up to 300% for customers choosing a non-Azure cloud infrastructure.**

Respondents highlight that there are no specific technical reasons to justify such a price differential; rather, this is engineered by Microsoft as a means to raise rivals' costs, by drawing an artificial distinction between the licensing terms that competitors' customers receive, versus those that Microsoft sells to its own customers.

“There is a pricing distortion in the market. When [my company] chooses to execute its workloads on third-party clouds, it costs significantly more than on native [Microsoft] infrastructure.”

82. This issue came to the fore as part of the new BYOL terms introduced in 2019, under which customers seeking to deploy on-premise licences on the cloud would be forced to renew their licence, via the purchase of a Licence Mobility through Software Assurance option. Whilst Microsoft technically formed part of the group of Listed Providers affected by the policy – which includes Amazon, Google and Alibaba – Microsoft had carved out a special licensing provision for Azure, defined as the “Azure Hybrid Benefit”.

83. Under this arrangement, the surcharges applicable to the ordinary Licence Mobility terms would be offset by virtualisation benefits reserved exclusively for Hybrid Benefit users. These include:

- Economic benefits for moving highly virtualised workloads to Azure: for example, SQL Server Enterprise Edition customers can get four cores in Azure in the General Purpose SKU for every core they own on-premise for highly virtualised applications;
- The provision of a dedicated PaaS destination on Azure (SQL Managed Instance), which is highly compatible with SQL Server.

84. As a result, Microsoft's customers agreeing to port their licences directly onto Azure effectively receive a bundled discount; the choice to deploy on other providers, on the other hand, becomes up to five times more expensive than on Azure, as per Microsoft's own guidelines.³⁶ A more precise estimate of this cost differential, and the resulting economic harm, is provided as part of Section 2.3.2.

85. Indeed, Microsoft itself emphasizes on the seamless use of SQL Server, especially as pertains to its cost advantages, as a centrepiece of customers' decision to choose Azure. It characterises Hybrid Benefit as a "*licensing offer that helps to migrate and save to Azure*",³⁷ and that whilst Azure SQL Database offers these advantages, licence mobility "*doesn't allow any special cost benefits for moving virtualised workloads to the cloud.*"³⁸ **These surcharges can place third-party providers in a substantial disadvantage**, and were noted, in certain cases, **to provide customers with sufficient incentives to prefer Azure altogether.**

86. Respondents also pointed to the existence of several additional characteristics, inherent to SQL Server, which may further accentuate these competitive concerns.

- Firstly, SQL Server is considered an integral part of many enterprise workflows, with limited substitutability both on the supply and demand side. Relational database management systems (RDBMS) are distinctive within the cloud computing suite in terms of the significance of its lock-in effects, given the complexity of data migration and the compounding nature of the problem as an organisation's data footprint grows;
- Secondly, we may note that SQL Server licensing can represent a meaningful proportion of an enterprise's total cloud spend. For example, respondents estimate that the licensing of SQL Server instances can cost up to 20% of their yearly cloud expenditure. Faced with these surcharges, users have the meaningful incentive to favour the product combination that minimises their total spend. This consideration often results in users foregoing competing services, even if Azure's services are generally considered as being less comprehensive and performant.³⁹

87. This capacity — to influence the price and supply conditions in the cloud infrastructure market — was noted by respondents to reflect Microsoft's significant market power. By leveraging the terms of use of its software licences, often modified in an abrupt and unilateral manner, the vendor was described to take steps to limit the choice set of its customers. Importantly, **some respondents note that, in most cases, the existence of a threat of change to software terms of use can alone be sufficient to dent the attractiveness of competing cloud offerings.** Given knowledge of Microsoft's capacity to impose retaliatory licensing measures, which can raise overnight the cost of doing business with third-party infrastructure providers, this creates a strong deterrent against customers' recourse to mixed cloud solutions.

2.2.2 Restrictions on Office 365 portability

88. Another key competitive concern pertains to licence portability. Respondents note that Microsoft severely limits users' freedom to deploy and virtualise on-premise licences on externally-hosted infrastructure.

89. Under this policy, which specifically concerns Office 365, users migrating to the cloud are forced to repurchase their existing licence if they choose to deploy the product within a third-party environment. **Users are required to pay the additional licence fee, which costs 80-100% of the original licence price, even if they had already paid Microsoft to run the software** in their datacentre under an on-premise arrangement.

90. In contrast, it was noted that Azure products are often exempt from such restrictions. On two separate occasions, respondents describe that whilst they had originally intended to use Office 365 via Workspaces, AWS' virtual desktop environment, they were ultimately brought to use Windows Cloud PC, Microsoft's in-house solution, as the latter allowed for the seamless transferral of licences between operating environments. This decision was made, it may be noted, despite the fact that the respondents had the entirety of their cloud infrastructure operating on AWS, and would have thereby preferred AWS as their virtual desktop provider of choice.
91. The ability of Microsoft to set licensing terms, and to dictate a customer's choice of environment for any given product, significantly impedes lesser-integrated players' ability to offer a complete product portfolio based on price and qualitative considerations. This issue may be particularly relevant for the cohort of small, independent cloud providers, who may service only localised segments of the computing stack, and are thereby reliant on integrated providers to obtain the conditions of access to key product offerings. By directly raising the relative price of these offerings, **Microsoft was noted to create strong incentives against the use of mixed cloud solutions — and in doing so, turn customers towards its own integrated products.**
92. To this end, a respondent characterises Azure's growth as largely owing to Microsoft's ability to leverage its existing Enterprise Agreements — along with users' familiarity with its products — to drive adoption of Azure ecosystem. Specifically, the dominance of the 365 Suite may serve as an effective entry point, opening the way for the provider to cross-sell its offerings and to increase users' cloud footprint.

“[Microsoft leverages] users' familiarity with its products to drive adoption of the Azure ecosystem [...] [and has] a stance against users deploying Microsoft products on non-Azure infrastructure.”

93. When asked about whether this dominance in SaaS can further lead to a snowball effect, with users gradually becoming entrenched in the Azure ecosystem, the respondent confirms this assessment. Specifically, one of the respondents noted that along with Office 365, there are three other products that lead as an effective gateway into Azure: (i) SQL Server, as discussed, (ii) Dynamics, Microsoft's in-house ERP solution, and (iii) Active Directory, which is optimised within the Azure ecosystem to allow for the seamless management of domains across users and services. By leaning on its dominance in each of these products, as well as taking additional steps to tie them more closely together, **Microsoft is able to reinforce its hold on enterprise customers, and increase the costs for users looking to source individual product components from third-party providers.**

94. As an extension to this discussion, it may be noted that, in response to the public and regulatory outcry regarding its policies, Microsoft eased the restrictions on the virtualisation of its licensed software on infrastructure hosted by external partners. The policy change, announced in October 2022 in a blog post published by Chief Partner Officer Nicole Dezen, described “*expanded use rights*” that increase the flexibility for customers choosing to bring their software onto third-party clouds.⁴⁰
95. Specifically, Microsoft notes that this policy change will make it “*easier than ever*” to license Windows Server for virtual environments, by relaxing the licensing rules “*that reflected legacy software licensing practices, where licences are tied to physical hardware.*” As a result of the policy change, Microsoft on-premise licence holders receive the following benefits:
- Customers with products subscriptions or Software Assurance are able to directly port their licences onto outsourcers’ infrastructure, dedicated or multitenant. This process can be carried out without additional contractual hurdles: prior to October 2022, external partners required the explicit authorisation from Microsoft regarding BYOL, and had to follow a rigorous process of licence verification each time an end customer brought a licence;
 - External partners are able to host a broader range of Microsoft licences, whereas prior to the policy change, the terms defined under BYOL only allowed for the virtualisation of a limited set of products (e.g. SQL Server, Office 365, Windows Server).
96. However, it is important to note that **these new freedoms carry strong caveats**, insofar that (i) the policy excludes the Listed Providers (i.e. AWS, Google) from the licensing changes, and (ii) the change only applies to external providers who deliver cloud services directly to customers. As part of its stipulations, Microsoft notes that its Services Provider Licensing Agreement (SPLA) terms are strictly intended for partners offering hosting “*from their own data centres*”, and thereby excludes providers who procure Microsoft licences in view of provisioning these via Listed Providers’ datacentres. The updated policy can be viewed in this regard as a continuation of Microsoft’s stranglehold on Listed Providers, both as direct providers of infrastructure and as outsourcers of these services via SPLAs.
97. In light of these facts, whilst the easing of virtualisation rights may have signalling purposes, there are substantive reasons to question whether these changes will indeed lead to fairer competitive outcomes in the long term, or if they will only serve to further consolidate Microsoft’s market position within the cloud space. A cloud executive expressed caution, noting that “[Microsoft] *proposes to select cloud providers about whom it is less competitively concerned and allow its software to run only on those providers.*”⁴¹ Indeed, given that many of the independent cloud providers are already bound by Microsoft’s SPLA terms, this policy revision may serve to tighten Microsoft’s control over its products, and effectively ties smaller cloud competitors to the Azure ecosystem and its web of licensing terms and conditions.

98. Finally, it may be noted that in any case, the BYOL policy change comes “too little too late”, given that economic harm has already been incurred in the period between 2019 and 2022. Over this period, a substantial cohort of customers may have already chosen to deploy their licences on external infrastructure, and thereby forced to incur licence repurchasing costs; alternatively, they may have chosen to migrate to Azure, resulting in market loss for competitors. In the latter case, the existence of switching costs only serves to solidify the **long-term and irreversible nature of the damage that such one-time policies may bring.**

2.3 THE UNFAIR SOFTWARE LICENSING PRACTICES RESULT IN EXTRA COSTS AND REDUCED PERFORMANCE FOR CLOUD CUSTOMERS

2.3.1 The first-year extra costs caused by Microsoft’s licence repurchasing policy for Office 365 can be estimated at €560m in Europe

99. This section documents how Microsoft’s software policy change in late-2019, in which it required its Office 365 customers to repurchase their existing on-premise software licences if deployed on third-party cloud infrastructure, resulted in a total cost of €100-€930m in Europe. **The baseline estimate, based on conservative assumptions, is €560m.**⁴² As a reference point, comparing this with Microsoft’s European Office 365 revenues in 2019 — the European office productivity software market size was €4bn, approximately half of which accrued to Office 365^{43,44} — this implies a surcharge of approximately 28%.

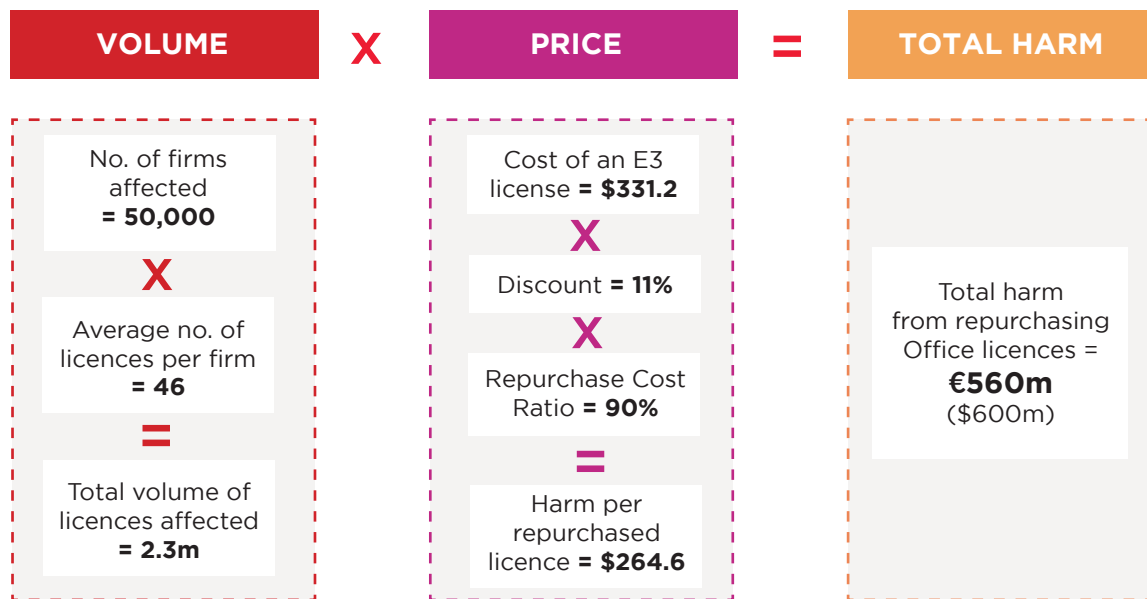
100. The figure estimated applies to companies that rescheduled their licence repurchase to at least a year earlier than their original plans and, consequently, incurred at least one year of extra costs. As we only calculate the costs for the first year and some companies may have born extra costs for longer (i.e. if forced to make the repurchase more than one year ahead of time), our estimate might be considered the lower bound of the total overcharge.

101. It is of note that the costs we calculate may be described as pure extra costs, since the repurchased licence did not include any novel or updated services beyond the ability to deploy an already-owned software on third-party cloud infrastructure — an option that used to be free of charge. Furthermore, existing on-premise licences could be practically freely deployed after the policy change on Microsoft’s own IaaS, Azure, suggesting that the repurchasing policy indeed did not involve any substantive improvement.

102. To calculate our aggregate figure, we rely on four distinct variables that are multiplied together:

- The number of European firms that deployed Office on non-Microsoft IaaS in 2019 and repurchased their licences by at least one year ahead of time;
- The average number of Office licences per firm;
- The average (effective) annual price of a Microsoft Office 365 licence;
- The average proportional cost of repurchasing Microsoft software — it is assumed to be approx. 90% of the original licence price, as per responses to our survey.

Figure 4: First Year of Relicensing Extra Costs Estimation - Repurchasing Office 365 E3 Licences for Third Party IaaS Use



- 103.** Firstly, we calculate the number of European firms that deployed Office on non-Microsoft IaaS in 2019 and repurchased their licences at least a year before planned. To do so, we estimate the total number of firms that held Office 365 licences in the European Union in 2019 to be equal to 506,673.⁴⁵
- 104.** Having calculated the number of firms that held an Office licence, the next step consists in estimating the share of these firms which deployed their licence on non-Microsoft IaaS. To do so, we rely on the share of European firms that used cloud computing services in 2018 (23.9%),⁴⁶ IaaS-using firms as a share of firms using cloud services in the EU in 2021 (73.5%)⁴⁷ and the market share of Microsoft Azure's rivals in the IaaS market in 2019 (83%).⁴⁸ Finally, we do not claim that all of these firms repurchased their licences. Instead, we assume that only those companies made repurchases that were not in the last year before their planned repurchase (66.7%),⁴⁹ thereby would have had to operate without updates for longer than a year. Multiplying these four shares with the number of firms having Office licences results in 49,274, our final estimate for the number of European firms that held Office 365 licences, deployed them on third-party IaaS in 2019 and repurchased them following the analysed policy change.⁵⁰
- 105.** Secondly, to estimate the average number of Office licences per firm, we multiplied the share of workers with tertiary education in the European Union (35.1%)⁵¹ with the average firm size of companies using Office 365 (131.8 employees).^{52,53} Moreover, it may be noted that applying the share of workers with tertiary education in the *entire economy* might understate the share of workers with tertiary education at *Office-using firms* as those firms tend to be more digitally advanced, supposedly employing more high-skilled workers. Assuming that Office licences are purchased for 51.3% of workers⁵⁴ rather than 35.1% increases the range of extra costs to between €140 and €1,360m.

106. Thirdly, in our baseline estimation, our assumption on the average annual price of an Office 365 licence is the price of an Office 365 Enterprise E3 licence in 2022 (\$331.2). Additionally, we also provide estimates assuming that all affected licences were of the cheapest and of the most expensive available Office 365 types, F3 (\$57.6) and E5 (\$547.2), respectively, to present a reasonable range of costs.⁵⁵

107. We base our licence fee assumption on retail prices. However, large customers intending to buy licences for numerous users may receive sizeable discounts from Microsoft. To approximate these discounts, we assume that the maximum discount is achieved when the price offered to governments, arguably large and influential customers, is paid by a firm. In practice, we apply half of the average of governmental discounts offered on F3 (16.7%), E3 (27.5%) and E5 (23.2%) licences, which implies a price reduction of 11.2%⁵⁶ in our baseline average (effective) licence price calculation.^{57,58}

Table 1: First Year of Relicensing Extra Costs Estimation – Repurchasing Office 365 Licences for ThirdParty IaaS Use

Variable	Baseline Assumptions	Alternative 1	Alternative 2	Alternative 3
(1) No. of firms deploying O365 on non-MS IaaS that repurchased at least one year ahead of time [(2) x (3) x (4) x (5) x (6)]⁵⁹	49,274	24,637	49,274	49,274
(2) Number of firms holding Office 365 licences in the EU	506,673	506,673	506,673	506,673
(3) % of cloud user firms in the EU	23.9%	23.9%	23.9%	23.9%
(4) Share of European cloud user firms that use IaaS services	73.5%	73.5%	73.5%	73.5%
(5) Non-Microsoft share of the IaaS market	83.0%	41.5%	83.0%	83.0%
(6) Share of firms that repurchased their licences at least one year ahead of time	66.7%	66.7%	66.7%	66.7%
(7) Average no. of licences per firm [(8) x (9)]	46.3	46.3	67.6	46.3
(8) Average firm size (number of employees)	132	132	132	132
(9) % of workers for whom Microsoft licences are purchased	35.1%	35.1%	51.3%	35.1%
Average annual licence price (retail price in 2022 USD)				
(10) Office 365 F3	57.6	57.6	57.6	57.6
(11) Office 365 E3	331.2	331.2	331.2	331.2
(12) Office 365 E5	547.2	547.2	547.2	547.2
(13) Average discount	0.888	0.888	0.888	0.775
(14) Proportional cost of repurchasing the licence	90%	90%	90%	90%
Total Cost Calculation (in 2022 EUR)				
(1) x (7) x (10) x (13) x (14) - Office 365 F3	97,726,285	48,863,143	142,747,198	85,349,092
(1) x (7) x (11) x (13) x (14) - Office 365 E3	561,926,139	280,963,070	820,796,386	490,757,279
(1) x (7) x (12) x (13) x (14) - Office 365 E5	928,399,708	464,199,854	1,356,098,377	810,816,374

Source: all sources are noted in the main text.

108. Finally, the product of the number of European firms that held Office licences and deployed them on third-party IaaS (49,274), with the average number of licences per firm (46.3) approximates the number of Office 365 licences affected by the policy change. Multiplying this number, the average annual licence price assuming an average discount of 11.2% (F3: \$50.2, E3: \$288.7, E5: \$477), and the proportional cost of repurchasing the licence for third-party cloud use (90%) results in a final harm estimate ranging from €100 to €930m, depending on the type of licences. The baseline estimation and some calculations relying on alternative assumptions are shown in Table 1.

109. To better understand the impact of this policy on a firm, we provide below a series of examples of firm-level extra costs, according to different firm sizes and exposure to the policy. Indeed, firms where only a minor share of employees use Office bear a lower cost than highly digitalized firms. Nevertheless, most firms are likely to pass on, to varying degrees, the cost increase to their end customers in the form of higher output prices, implying lower welfare for these consumers. The detrimental impact may be particularly acute in the case of the public sector, in which increasing costs must be financed by the taxpayers themselves, thereby diverting resources from other governmental objectives or requiring higher taxation.⁵⁹

Table 2: Examples for Firm-level Extra Costs of Repurchasing Office 365 Licences for ThirdParty IaaS Use (One Year)

	Small-size (50 employees)	Mid-size (100 employees)	Large-size (15,000 employees)
Low-exposure (20%; e.g. accommodation and food service)	€ 2,465	€ 4,930	€ 739,505
Medium-exposure (35.1%; e.g. transportation)	€ 4,326	€ 8,652	€ 1,297,831
High-exposure (90%; e.g. finance)	€ 11,093	€ 22,185	€ 3,327,772

Notes: the table shows firm-level extra cost estimates implied by Microsoft Office licence repurchasing that are calculated by multiplying the number of employees indicated in the column header, the share of these employees that need MS Office licences indicated in the first column, and three further inputs from Table 1 (baseline assumption): the annual price of an E3 licence, the cost of repurchasing a licence, and the average discount.

2.3.2 The total overcharge on SQL Server users who deploy the software on third-party IaaS and cannot enjoy Azure Hybrid Benefit may reach €1bn

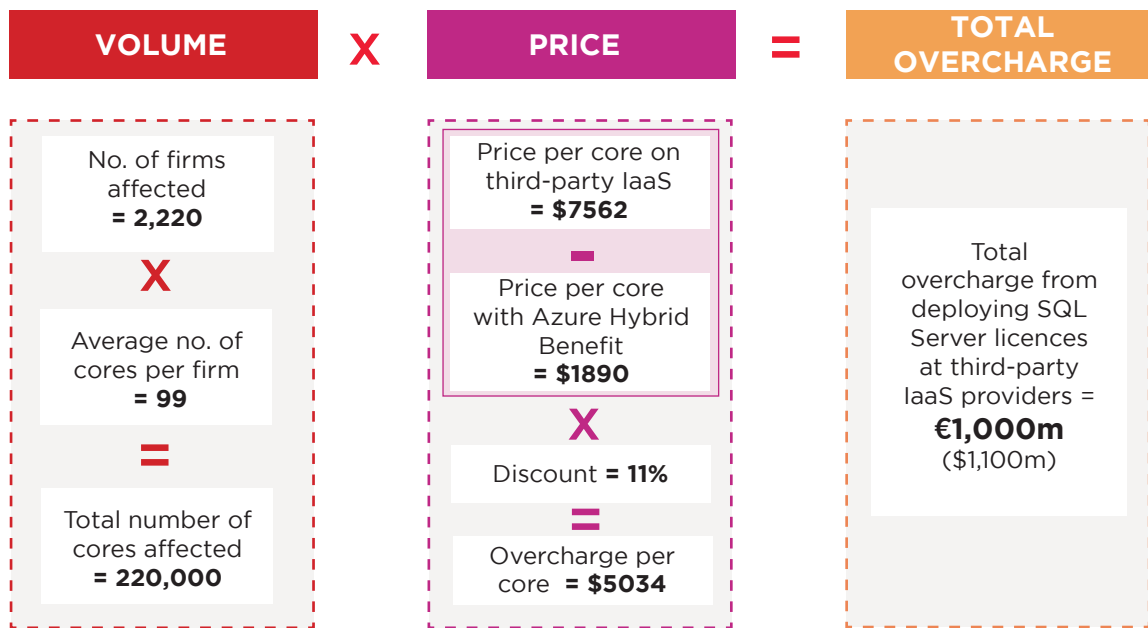
110. As pertains to the impact of the policy change on SQL Server users, one may note that Microsoft’s Azure Hybrid Benefit policy states: “[f]or every 1 core of SQL Server Enterprise Edition, you get 4 vCPUs of SQL Managed Instance or Azure SQL Database general purpose and Hyperscale tiers, or 4 vCPUs of SQL Server Standard edition on Azure VMs.”⁶⁰ In this regard, by effectively serving to cut the per-core price of Microsoft’s SQL Server by a factor of four when deployed on Azure, the policy treats unfairly customers who cannot, or choose not to, pick Microsoft over third-party infrastructure providers.

111. In quantifying the overcharge suffered by companies that shifted from on-premise SQL Server to third-party cloud deployment between the end of 2019 and 2022, we find that this amounts to €500-€1,900m in the European Union alone. **The baseline estimate, based on conservative assumptions, lies in the middle of the range at €1bn.**

112. The calculation of the total overcharge is similar to the previous section, and consists in the multiplication of three distinct variables (Table 3):

- The number of European firms that started to deploy SQL Server on non-Microsoft IaaS between 2020 and 2022;
- The average number of cores required per firm;
- The difference in the average (effective) price of a perpetual SQL Server 2022 licence (i) when it is deployed on third-party IaaS, or with (ii) Azure Hybrid Benefit (per core).

Figure 5: Overcharge on SQL Server for non-Microsoft IaaS Use



113. The approximation of the number of European firms that began to deploy SQL Server on non-Microsoft IaaS between 2020 and 2022 is done in four steps.

- The first step in the estimation requires calculating the number of European firms that possessed SQL Server licences around 2020-2022, using the 2021 figure in our calculation. This is carried out in a few consecutive steps, resembling the approximation of the number of Office 365 licence holder firms, and results in 22,384.⁶¹
- We calculate the number of SQL Server-using firms that migrated to the cloud between 2020 and 2022 (both inclusive), by multiplying 22,384 and the difference in the share of European firms who used cloud services at the beginning and at the end of this period (17.1%).⁶²

- Finally, to calculate the share of non-Microsoft IaaS user firms out of all firms that moved to the cloud, we multiply the calculated number of European cloud migrant and SQL Server user firms with the share of IaaS user firms in the total number of European firms that use cloud services (73.5%) as well as the share of firms other than Microsoft in the worldwide IaaS market (78.9%).⁶³ This multiplication returns 2,220 as the number of European firms that migrated to the cloud and deployed their SQL Server licences on non-Microsoft IaaS between 2020 and 2022.⁶⁴

114. Secondly, we calculate the number of cores required by the average firm, by multiplying three distinct variables.

- Firstly, the average firm size (964 employees) is approximated based on the employment size distribution of SQL Server licence possessing firms in 2023;⁶⁵
- Secondly, this figure is multiplied by the share of online job advertisements that mention SQL skills as a necessary requirement in the United Kingdom in the period between April 2017 and March 2018 (4.8%), such that we arrive at the count of employees requiring SQL software licences.⁶⁶ The underlying assumption is that the percentage of job adverts that consists in the expected knowledge of SQL is a good, conservative approximation to the share of workers that use SQL in their daily work and, thus, need to obtain a licence;⁶⁷
- Lastly, to convert the number of SQL-using employees to the number of cores demanded, we take the average of the recommended vCPU per person for single-session (there is only one user logged on to a session host virtual machine at any one time; 4 vCPU per user) and multi-session use (there is more than one user logged on to a session host virtual machine at any one time; min. 0.25 vCPU per user) with medium workload type from Microsoft's website.^{68,69}

115. Lastly, we estimate the licence price for 2022 SQL Server. The current price of an Enterprise edition SQL Server 2022 perpetual licence is \$15,123.⁷⁰ This fee includes two cores. As the Azure Hybrid Benefit offers four virtual cores for every single on-premise one, we assume that a firm using third-party IaaS pays \$7,562 for a single core, while licensing a single core costs only \$1,890 for customers benefitting from the policy.

116. In our estimation procedure, we assume that all firms exposed to the overcharge deploy the enterprise version of the software. Furthermore, our choice of using the *perpetual* licence price rather than the *yearly* subscription fee stems from the assumption that, after joining the Azure Hybrid Benefit scheme, companies would enjoy the lower price for several years — i.e. until the renewal of their enterprise agreement. Consequently, affected firms are not overcharged in a single year but, presumably, over a longer period.

117. Enterprises purchasing numerous licences might reach preferential agreements with Microsoft over the per-core price of licensing. Therefore, we assume an average discount of 11.2% on retail prices in our baseline estimation, as in the case of Office 365 licences.^{71,72}

Table 3: Overcharge Estimation - SQL Server Overcharge for non-Microsoft IaaS Use

Variable	Baseline Assumptions	Alternative 1	Alternative 2	Alternative 3
(1) No. of firms deploying SQL Server on non-Microsoft IaaS [(2) x (3) x (4) x (5)]	2,220	1,110	2,220	2,220
(2) Number of firms holding SQL Server licences in the EU	22,384	22,384	22,384	22,384
(3) % of firms that migrated from on-premises to the cloud in the EU between 2020 and 2022	17.1%	17.1%	17.1%	17.1%
(4) Share of European cloud user firms that use IaaS services	73.5%	73.5%	73.5%	73.5%
(5) Non-Microsoft share of the IaaS market	78.9%	39.5%	78.9%	78.9%
(6) Average no. of cores per firm [(7) x (8) x (9)]	99	99	186	99
(7) Average firm size (number of employees)	964	964	964	964
(8) Share of employees requiring an SQL licence	4.8%	4.8%	4.8%	4.8%
(9) Number of cores per licensed employee	2.13	2.13	4.00	2.13
SQL Server 2022 licence price (retail price of Enterprise edition in 2022 USD)				
(10) Licence price per core for other customers deploying on third-party cloud	7562	7562	7562	7562
(11) Licence price per core for Azure Hybrid Benefit users after migration to cloud	1890	1890	1890	1890
(12) Average discount	0.888	0.888	0.888	0.775
Total Overcharge Calculation (in 2022 EUR)				
(1) x (6) x [(10) - (11)] x (12)	1,028,771,266	514,385,633	1,936,510,618	898,475,710

Source: all sources are noted in the main text.

118. An estimation of the firm-level extra cost confirms that SQL Server overcharge can have a very meaningful impact on the IT costs of representative firms, especially those that rely more on data-heavy workflows.

Table 4: Examples for Firm-level SQL Server Overcharge

	Small-size (50 employees)	Mid-size (100 employees)	Large-size (15,000 employees)
Low-exposure (1%; e.g. accommodation and food service)	€ 4,983	€ 9,966	€ 1,494,880
Medium-exposure (4.8%; e.g. transportation)	€ 23,918	€ 47,836	€ 7,175,424
High-exposure (10%; e.g. finance)	€ 49,829	€ 99,659	€ 14,948,800

Notes: the table shows firm-level SQL Server overcharge estimates that are calculated by multiplying the number of employees indicated in the column header, the share of these employees that need SQL Server licences indicated in the first column, and three further inputs from Table 3 (baseline assumption): the number of cores per employee, the price difference between the standard and Azure Hybrid per-core licence price, and the average discount.

119. We can then calculate the total extra cost incurred by representative firms exclusively for Office and SQL Server repurchases, by summing the values presented in the previous tables. The increase in costs is non-negligible: for instance, for small-sized firms with high exposure, such as a 50-person financial consulting firm, total extra costs would sum to around €60,000, roughly equivalent to the annual gross salary of a financial analyst in France.⁷³ For larger firms, the extra costs may be measured in millions of euros. Therefore, these policies probably had a significant impact on the costs borne by firms transitioning to the cloud and on their choice of cloud provider.

Table 5: Examples for Firm-level Office and SQL Server Overcharge

	Small size (50 employees)	Medium size (100 employees)	Large size (15,000 employees)
Low exposure (e.g. accommodation and food service)	€ 7,448	€ 14,896	€ 2,234,385
Medium exposure (e.g. transportation)	€ 28,244	€ 56,488	€ 8,473,255
High exposure (e.g. finance)	€ 60,922	€ 121,844	€ 18,276,572

Note: sums of corresponding cells in Table 2 and Table 5.

120. It is noteworthy to consider how the scalability offered by cloud resources can alter the nature of IT costs. In the past, IT expenditure was primarily a fixed cost; now, a large share of it may have become a variable cost. Therefore, contrary to fixed costs which, according to economic theory, do not affect a firm's pricing function, variable IT costs would influence pricing decisions and consequently impact the final price for customers. In other words, a firm dependent on cloud services is likely to pass a portion of its additional costs to its customers. Hence, **the repercussions of an increase in cloud costs are not confined to firms, but also likely to be directly felt by end customers.**

Endnotes

- 36 Microsoft Azure, Pay less with Azure, available at <https://azure.microsoft.com/en-us/pricing/azure-vs-aws/cost-savings>.
- 37 Microsoft, Azure Hybrid Benefit, available at <https://azure.microsoft.com/en-gb/pricing/hybrid-benefit/#overview>.
- 38 Microsoft, Azure Hybrid Benefit-Azure SQL Database & SQL Managed Instance, available at <https://learn.microsoft.com/en-us/azure/azure-sql/azure-sql-azure-hybrid-benefit?view=azuresql&tabs=azure-portal>.
- 39 One respondent noted two specific technical metrics on which this performance can be assessed: (i) latency, for which AWS was noted to offer substantially more low-latency performance than Azure, in light of the density of its datacentre coverage; and (ii) downtime, for which Azure was noted to suffer from substantially lengthier annual downtimes.
- 40 Microsoft, New licensing benefits make bringing workloads and licenses to partners' clouds easier, available at <https://blogs.partner.microsoft.com/partner/new-licensing-benefits-make-bringing-workloads-and-licenses-to-partners-clouds-easier>.
- 41 The Register (2022), Big cloud rivals hit back over Microsoft licensing changes, available at https://www.theregister.com/2022/08/31/cloud_rivals_hit_back_at.
- 42 We used the USD-EUR exchange rate as of 31 December 2022 (0.93) to convert dollars to euros. See, Exchange Rates UK, US Dollar (USD) to Euro (EUR) exchange rate history, available at <https://www.exchangerates.org.uk/USD-EUR-exchange-rate-history.html>.
- 43 Statista (2023), Technology Market Insights, available at <https://www.statista.com/outlook/tmo/software/productivity-software/office-software/eu-27>.
- 44 Enlyft, Companies using Microsoft Office 365, available at <https://enlyft.com/tech/products/microsoft-office-365>.
- 45 To begin with, we use data on the number of firms having Office 365 licences in Germany, the Netherlands, France and Belgium in 2023. Then, we lower the 2023 firm count to reflect the number of Office licence holder firms in 2019, by exploiting the fact that the number of Office 365 commercial seats grew by 15.3% annually between 2019 and 2022 (adjusting the 2023 firm count to reflect the 2019 count amounts to dividing the former by 1.153^3). Next, we use the ratio of the GDP of the European Union to the GDP of the four mentioned countries in order to inflate the total firm count so that it represents the entire EU, which results in the reported number. The assumption behind this step is that the ratio of the GDP and the number of firms that possess Office licences is the same in the European Union as in the group of four countries on which we have information. See, Enlyft, Companies using Microsoft Office 365, available at <https://enlyft.com/tech/products/microsoft-office-365>; Office365itpros, Office 365 Insights from Microsoft's FY21 Q2 Results, available at <https://office365itpros.com/2021/01/28/office-365-number-of-users-fy21q2>; Trading Economics, GDP|Europe, available at <https://tradingeconomics.com/country-list/gdp?continent=europe>.
- 46 Eurostat, Cloud computing - statistics on the use by enterprises, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Cloud_computing_-_statistics_on_the_use_by_enterprises.
- 47 Eurostat, Cloud computing services by size class of enterprise, available at https://ec.europa.eu/eurostat/databrowser/view/ISOC_CICCE_USE__custom_6288980/default/table?lang=en. (2021 appears to be the only year with observations).
- 48 See Figure 7.
- 49 We assume that this share is two-thirds because Microsoft released new versions of Office between 2007 and 2019 every three years. Thus, we use three years to approximate the typical length of an Office licence before repurchasing. Assuming that the number of firms repurchasing their licences is uniformly distributed over time and that firms in their last year before planned repurchase did not reschedule (or bore only minor extra costs if they did so), it follows that two-thirds of firms decided to repurchase prematurely.

- 50 More precisely, the product of the number of Office licence holder firms with the share of companies using cloud services provides us with an estimate on cloud service using Office licence holders. To obtain an estimate specifically on the number of IaaS-using firms, we further multiply this number by the share of IaaS-using firms in European cloud-using firms. However, the third assumption, i.e. the share of these firms that use third-party IaaS equals the market share of non-Microsoft IaaS providers, might overstate the actual percentage. The reason is that Office (or, Microsoft) users are probably more likely to be Azure users themselves than those who do not have a subscription for any Microsoft product. Considering this potential overstatement and, therefore, assuming a revised 41.5% instead of the baseline 83%, results in a range of potential extra cost between €50 and €460m.
- 51 Eurostat, Employment by educational attainment level - annual data, available at https://ec.europa.eu/eurostat/databrowser/view/LFSI_EDUC_A__custom_5239898/default/table?lang=en. The share of workers having tertiary education in the European Union in 2019, as percentage of total employment (workers aged between 20 and 64).
- 52 The average firm size is calculated by taking the midpoint of each firm employment size bin (e.g. 30 for the interval of 10 to 50 employees) and multiplying it with the number of firms falling into the given size bin, and dividing the resulting sum by the total number of firms. For the bin with at least 10,000 employees, we assumed an employment of 12,500 workers. See, Enlyft, Companies using Microsoft Office 365, available at <https://enlyft.com/tech/products/microsoft-office-365>.
- 53 The underlying assumption is that it is mainly higher-skilled, university-educated workers whom Microsoft licences are purchased for.
- 54 The average of individuals who used word processing software (58.26%) and spreadsheet software (44.28%) in the EU labour force (aged 25-64) in 2019. See, Eurostat, Individuals' level of computer skills (until 2019), available at https://ec.europa.eu/eurostat/databrowser/view/ISOC_SK_CSKL_I__custom_5289113/default/table?lang=en.
- 55 Infused Innovations (2022), The Complete Office 365 and Microsoft 365 Licensing Comparison, available at <https://www.infusedinnovations.com/blog/secure-modern-workplace/complete-office-365-and-microsoft-365-licensing-comparison>.
- 56 $1 - 0.5 \times (16.7\% + 27.5\% + 23.2\%) / 3 = 11.2\%$.
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- 58 In addition to this calculation, we also present more conservative estimates, assuming that the entire average governmental discount (22.5%) is the average discount on Office licences affected by the policy change. This assumption change reduces the range of extra cost estimates to €90-€810m.
- 59 For example, the United Kingdom spent approximately €127m (£112m) on Microsoft products in 2019, that included Office 365 E5 licences. See, Mathieson, SA, HMRC approved for £112m Microsoft spending, Civil Service World, 7 August 2019, available at <https://www.civilserviceworld.com/news/article/hmrc-approved-for-112m-microsoft-spending>. See also, January 2022 exchange rate at Exchange Rates UK, Euro to British Pound Spot Exchange Rates for 2019, available at <https://www.exchangerates.org.uk/EUR-GBP-spot-exchange-rates-history-2019.html>.
- 60 Microsoft, Azure Hybrid Benefit Savings Calculator, available at <https://azure.microsoft.com/en-us/pricing/hybrid-benefit/#calculator>.
- 61 To estimate the number of firms holding SQL Server licences in the EU, we use the number of such firms in France, Italy, Spain and Germany in early 2023. To transform these figures to 2021 values, we use the yearly average growth rate of the worldwide database management systems market in dollar terms between 2017 and 2021 (19.7%; in practice, we divide the early2023 figures by 1.197). Finally, we calculate the ratio of the sum of the gross domestic product of the aforementioned four countries to the gross domestic product of the entire EU, and divide the number of SQL Server licence holding firms in those four countries by this ratio to arrive at the final count of European firms that had SQL Server licences in 2021. See, Statista, Size of the database management system (DBMS) market worldwide from 2017 to 2021, available at <https://www.statista.com/statistics/724611/worldwide-database-market>; Enlyft, Companies using Microsoft SQL Server, available at <https://enlyft.com/tech/products/microsoft-sql-server>.

Unfair Software Licensing Practices:
A quantification of the cost for cloud customers

- 62 Eurostat, Cloud computing services by NACE Rev.2 activity, available at https://ec.europa.eu/eurostat/databrowser/view/ISOC_CICCE_USEN2__custom_5634758/default/table?lang=en. Owing to data availability, we use the 2018-2021 difference.
- 63 See Figure 7.
- 64 As in the previous section, we acknowledge that, since SQL Server is a product of Microsoft, firms that use SQL Server might be more inclined to deploy their licences on Azure than the percentage implied by the (unconditional) market share of Microsoft in the IaaS market. For this reason, we lower the assumed share of firms using third-party IaaS from 78.9% to 39.5% in an alternative calculation that results in a total overcharge sum of €500m.
- 65 Entirely following the calculation for Office 365, the average firm size is calculated by taking the midpoint of each firm employment size bin and multiplying it with the number of firms falling into the given size bin, and dividing the resulting sum by the total number of firms. For the bin with at least 10,000 employees, we assumed an employment of 12,500 workers. See, Enlyft, Companies using Microsoft SQL Server, available at <https://enlyft.com/tech/products/microsoft-sql-server>.
- 66 The share is calculated by dividing the job advertisements including SQL skills as requirement (453,690) by the total number of advertisements (9,400,191). See, Burning Glass Technologies (2019), No Longer Optional – Employer Demand for Digital Skills, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/807830/No_Longer_Optional_Employer_Demand_for_Digital_Skills.pdf.
- 67 While online job adverts do not encompass the entirety of UK job openings and overestimate the proportion of professional occupations, there are several reasons to believe that 4.8% might be a reasonable assumption on the share of workers using SQL software at SQL Server licence-holding firms. To begin with, the percentage we apply was estimated using a pre-Covid 19 sample, where there was lesser demand on business digitalisation and, therefore, lower demand for SQL expertise. Furthermore, the sample of job advertisements also includes a large number of openings in sectors that are marginally relevant for our analysis but contribute to lowering the share of SQL skills, given that they require limited SQL-related competencies (e.g. construction).
- 68 Medium workload is the expected workload of consultants or market researchers. Example applications include database entry applications, command-line interfaces, Microsoft Word or static web pages. See, Microsoft, Session host virtual machine sizing guidelines, available at <https://learn.microsoft.com/en-us/windows-server/remote/remote-desktop-services/virtual-machine-recs>.
- 69 Nonetheless, in an alternative scenario, we rely on a recommendation on the website of Hewlett Packard that “[m]ost users are well served with 2 or 4 cores, but video editors, engineers, data analysts, and others in similar fields will want at least 6 cores.” Consequently, four cores are used as a conservative alternative assumption, implying that the average SQL Server user firm is assumed to license 186 instead of 99 cores, which results in an increase in the overcharge costs from €1,000 to €1,900m. See, HP (2020), CPU Cores: How Many Do I Need?, available at <https://www.hp.com/us-en/shop/tech-takes/cpu-cores-how-many-do-i-need>.
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- 72 In addition to this calculation, we also present a more conservative estimate, assuming an average discount of 22.5% instead. This alternative assumption diminishes the annual overcharge estimate to €900m.
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3

THE EUROPEAN COMMISSION AND NATIONAL REGULATORS SHOULD URGENTLY ASSESS WHETHER SOFTWARE LICENCING PRACTICES QUALIFY AS ANTI-COMPETITIVE OR UNFAIR ILLEGAL PRACTICES

- 121.** As we describe in this report, specific behaviours of certain legacy software providers — in particular Microsoft — have caused **significant economic harm to cloud customers**. Therefore, regulators need to take urgent action to address these behaviours at scale and provide systemic remedies at the industry level.
- 122.** Specifically, corrective action is needed for unfair software practices, in which vendors choose, often in an arbitrary and unilateral manner, to draw artificial distinctions between the licensing terms that competitors' customers receive, compared to those applied to their own customers. These actions directly harm the contestability of such markets and can be expected to trickle down to end users, who will bear the higher cloud service prices in full or in part. Special attention should be paid to creating equal and fair competitive conditions in the sector, such that cloud providers compete on merit and that innovation in the cloud sector works in the favour of all.
- 123.** The pace of growth of the European cloud market lends further weight to such an urgency. Indeed, the rapid growth of cloud services may imply that **our estimates, which pertain to the impact of policy changes enacted in years past, may only represent a lower-bound estimate of the potential surcharges suffered**, as a similar policy enacted today would translate into a drastically higher aggregate overcharge. Relatedly, this report only quantifies the effect of a few select examples of unfair licensing practices. However, these form only **part of the wider picture of economic harm caused to cloud customers**, given the increasing number of touchpoints that modern IT customers form with legacy software vendors' ecosystems.
- 124.** In light of this, it may be noted that several pivotal regulations by the EU addressing competition — in the digital ecosystem at large (e.g. Digital Markets Act) and data portability and switching in particular (e.g. Data Act) — are not designed to address these specific licensing behaviours. Therefore, they risk proving insufficient in addressing the potentially anticompetitive conducts relating to these restrictions. An investigation pursuant to Article 102 into legacy software providers' licensing practices may, in this regard, be a more effective means to tackle the harmful and urgent situation faced by cloud infrastructure customers.
- 125.** Indeed, the anticompetitive practices discussed in this report may directly relate to the provisions set forth by Article 102, which prohibits certain behaviours by entities that command a dominant position in their respective markets. The list of prohibited practices includes the imposition of unfair prices or trading conditions, the application of dissimilar conditions for equivalent transactions with trading parties, and the practice of requiring counterparties to accept auxiliary obligations in contract agreements.⁷⁴ Most of these practices echo the feedback received from respondents to our survey.
- 126.** For instance, the EC's guidance clearly considers customer foreclosure as a violation of Article 102. In particular, it states that *"if the dominant undertaking prevents its customers from testing the products of competitors or provides financial incentives to its customers on condition that they do not test such products, or pays a distributor or a customer to delay the introduction of a competitor's product"*, then such a conduct would be in violation of Article 102.⁷⁵

In this regard, a relevant precedent worth considering may be the decision taken in Microsoft (T-201/04),⁷⁶ in which the EC found that Microsoft had tied its nascent products to – and refused to disclose critical interoperability information for – its dominant Windows Operating System. As highlighted in our report, practices having analogous effects seem to be prevalent amongst legacy software vendors, with input and customer foreclosure being particular points of concern that may warrant further investigation.

- 127.** A potential complement to the recourse to existing competition instruments, i.e. those pursuant to Article 102, may be the recently enacted Digital Markets Act (“DMA”).⁷⁷ Indeed, the practices and patterns of behaviour identified in this study are in general alignment with those that the DMA aims to stop, and cloud computing services are designated as a “Core Platform Service” within the Act’s provisions.
- 128.** Nonetheless, it may be noted that the DMA may not fully respond to the scope of issues under investigation. In particular, a number of potential characteristics specific to the software market (incl. market size, scope of activities) may imply that the DMA, as currently constructed, has limited applicability to such practices. It may be noted, for instance, that even if Microsoft were designated as a “gatekeeper”, the conduct obligations set forth in Articles 5 and 6 of the DMA may not necessarily preclude these unfair software licensing practices. Indeed, each of the adjacent products under investigation – which Microsoft strategically leverages to drive adoption of Azure cloud infrastructure services – would first need to be designated as a “Core Platform Service”. This thereby limits the direct impact of recourse based on the DMA.
- 129.** Moreover, any such investigation would likely require further preliminary work from the EC, such as the launch of a sector enquiry and/or modifications to the existing legal provisions. By the time that such tools and instruments are fully developed, market capture may have deepened, and the competitive imbalances in the sector sufficiently entrenched as to become potentially irreversible. Microsoft’s recent concession, in which it offered to charge a service fee for its Teams product, may provide an instructive example,⁷⁸ as the retroactive change does little to address the permanently disadvantaged position faced by Microsoft’s competitors in the collaboration software space.⁷⁹
- 130.** In light of these elements, **it is important that the EC, and the relevant national authorities, take steps to duly consider these behaviours and to enforce appropriate measures against these unfair licensing practices.** Recourse to traditional competition instruments, such as Article 102, provide a self-sufficient basis on which to qualify and assess the abusive behaviours in question. The DMA could serve as a future complement, but not substitute, to immediate action pursuant to Article 102. **An investigation, and the subsequent recommendations to ensure fair competition, would allow cloud services to fulfil its promise – that of flexible, elastic computing without contractual lock-in.** And therein, ensure that businesses and end consumers continue to reap the benefits of cloud services in the long term.

Endnotes

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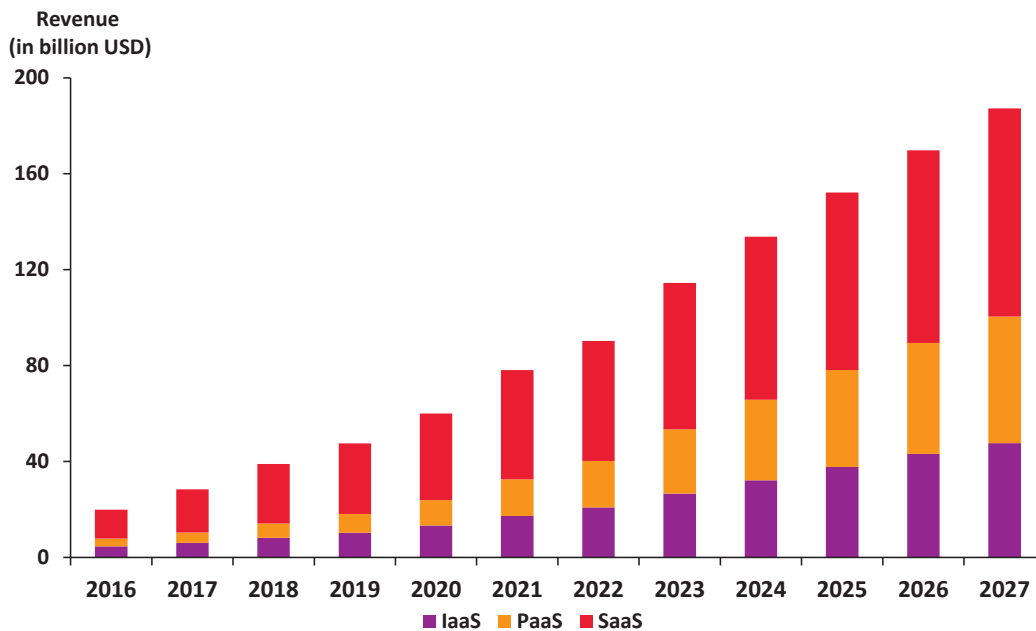
4

ANNEX



- 131.** The European public cloud market, including IaaS, PaaS and SaaS, reached a total market value of \$90.25bn in 2022, with growth projected at an annual rate of 15.72% to reach a value of \$187.20bn by 2027 and SaaS generating the biggest revenues (see Figure 6).⁸⁰ As discussed, IaaS refers to a service model in which essential computing resources are outsourced to the infrastructure of external providers. Within this, the category of services market can further be broken down into three main components, which are computing, storage, and network. Computing refers to physical servers that provide virtual instances with desired amounts of processing and memory (CPU & GPUs); storage are repositories in which data is stocked and can be retrieved; and networking delivers the connective tissue, such as routers, that links the various storage, virtual machine, internet, and cloud components.
- 132.** Given its ability to deliver a comprehensive set of computing resources in an elastic and an on-demand manner, the IaaS market has experienced substantial growth over recent years. In 2022, the total revenue generated from IaaS was \$20.84bn. This is expected to grow at an annual rate of 17.97%, reaching \$47.62bn by 2027 (see Figure 6). On similar lines, the European public cloud market reached a total market value of \$90.25bn in 2022, with growth projected at an annual rate of 15.72% to reach a value of \$187.20bn by 2027.⁸¹

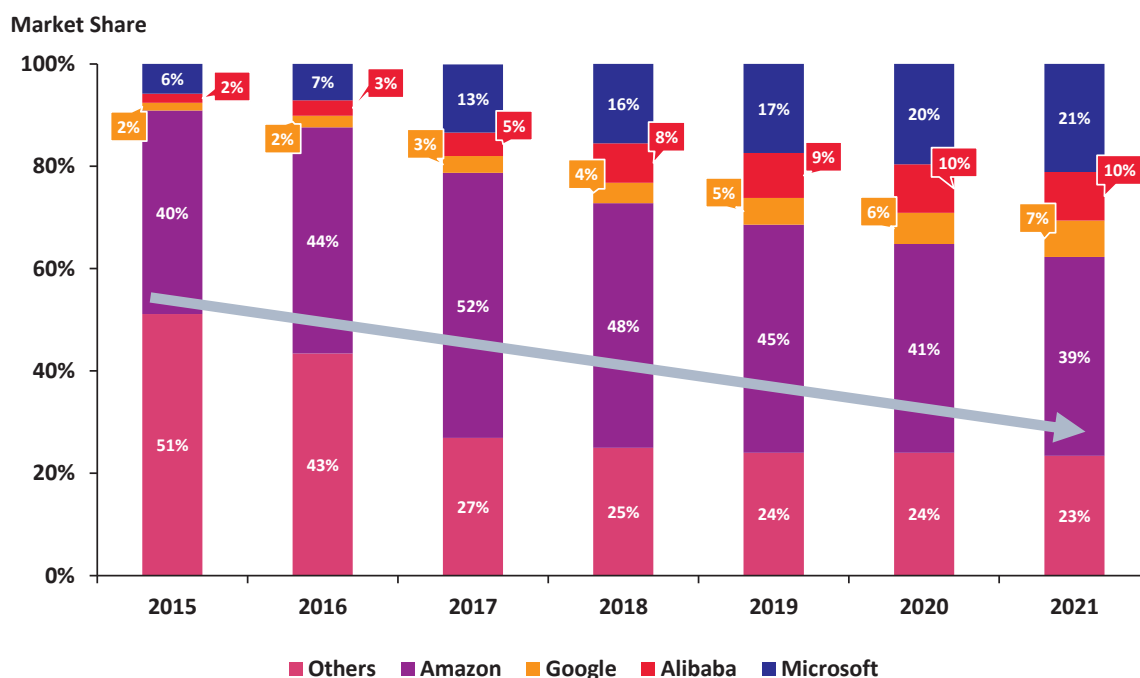
Figure 6: Revenue by Segment



133. The notable players in the IaaS market segment are Amazon, Microsoft, Alibaba and Google. Amazon was the first provider to offer IaaS services in 2006 through Amazon Web Services (AWS), in what represented a substantial headstart over key competitors such as Azure and Google. As illustrated in Figure 7, AWS generated \$35bn in revenues from its IaaS business in 2021, making it the market leader with share of almost 40%. Altogether, the top four players constituted around 77% of the overall IaaS market segment, with the remaining 23% fragmented amongst other small providers.

134. It is of note that over time, the market sector has demonstrated a marked tendency towards increasing levels of concentration. Importantly, as shown in Figure 7 below, the gains in share for the larger cloud providers have come at the expense of other small providers, with the market share of “Other” competitors almost halving from 51% to 23% between 2016 and 2021. In parallel, Microsoft was able to triple its share, growing from 6% to 21% over the same period. This gradual consolidation may point to the deteriorating ability of smaller, non-integrated players to offer effective competition against the conglomerate ecosystems of large cloud vendors.

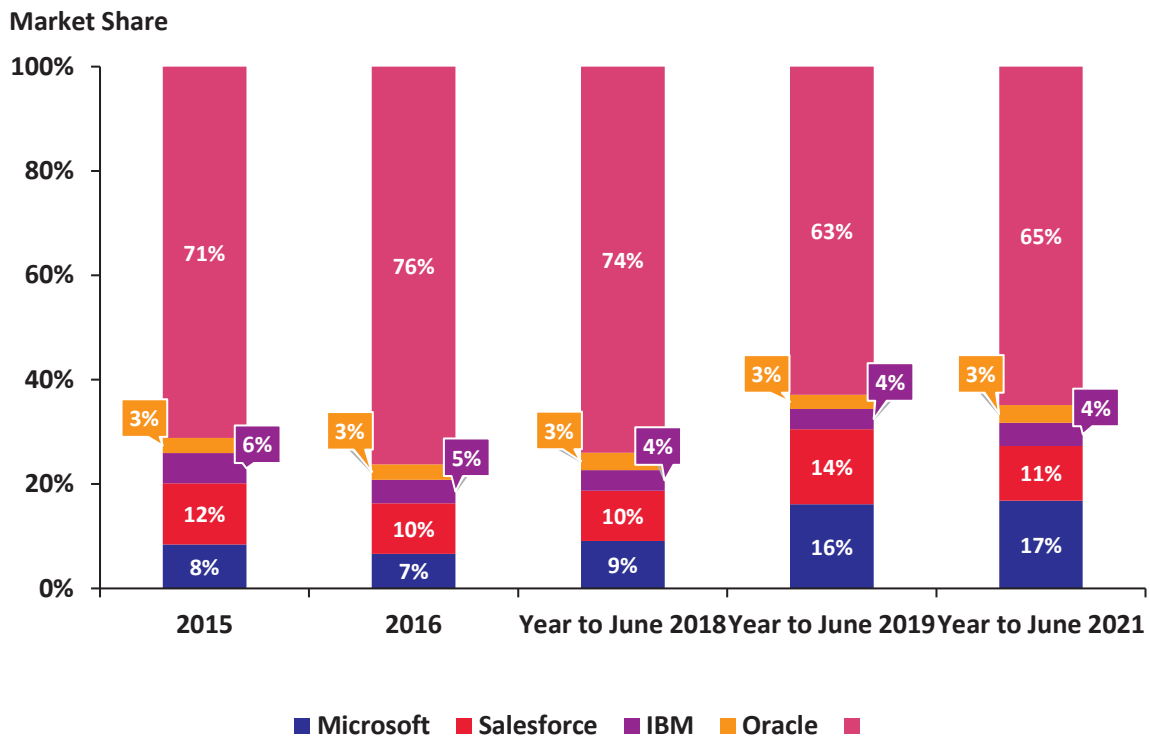
Figure 7: Market Share for IaaS



Source: Statista, Vendor share from the public cloud services IaaS market worldwide 2015-2021

- 135.** As regards to PaaS, which offers building blocks with which developers can build applications, the market sector has also witnessed substantial growth over recent years. The total market size grew from \$3.26bn in 2016 to \$19.44bn in 2022 and is expected to grow at an annual compounded rate of 22.13%, reaching a total market segment value of \$52.83bn by 2027 (see Figure 6). Amongst the different components of PaaS, application development constituted the largest share of the overall market, representing circa 50% in 2021.⁸²
- 136.** The key players in the PaaS market segment are Amazon, Microsoft, Alibaba, IBM and Google. In 2021, these top providers constituted around 72% of the overall market sector. Within this, AWS was the market leader with 36.6% market share, followed by Microsoft (20.5%), Alibaba (6.2%) and Google (4.9%).⁸³ According to data collected by the Netherlands Authority for Consumers and Markets (ACM), the combined IaaS and PaaS market segment is equally characterised by high concentration. In their *Market study of cloud services*, they report AWS and Microsoft Azure as each controlling shares of 35-40% in Europe, followed by GCP and Oracle (5-10%). The ACM notes, in particular, that Microsoft Azure has a larger market share footprint (40-45%) in Netherlands vis-à-vis Europe since Netherlands is a “Microsoft-oriented country”.⁸⁴ The evolution of the IaaS and PaaS market segments once again points to increasing concentration, with Microsoft, AWS and Google being the leading providers.
- 137.** As regards the third component, i.e. SaaS, it may be observed that this constitutes the largest component of the cloud market segment, representing 55% to the overall European public cloud market segment, followed by IaaS at 23%.⁸⁵ However, the market segment for SaaS differs from IaaS and PaaS insofar that at the aggregate, the level of concentration is not as marked. As shown in Figure 8, the major players in this segment, i.e. Microsoft, Salesforce, IBM and Oracle, account for 35% of the overall market sector, with Microsoft being the leader and contributing to one-fifth of the total revenues in 2021.
- 138.** However, it might equally be noted that the SaaS market segment includes a multitude of different, non-substitutable, products and hence should be broken further down into sub-segments. Whilst no actor seems to have a dominant position in the whole market segment for SaaS products, providers may have a stronger position on certain specific components. For instance, within the Customer Relationship Management (CRM) software space, Salesforce is the undisputed leader, where it controls 24% of the market segment and is trailed by SAP at 5%.⁸⁶ Furthermore, owing to the vertical integration of services between IaaS, PaaS and SaaS offerings, (e.g. SaaS services are generally built on PaaS and IaaS, without which they cannot be scaled up or down flexibly⁸⁷), one may observe that control of one-fifth of the entire market, such as that by Salesforce, may be sufficient to establish substantial comparative advantages. For instance, providers who offer products across multiple market segments may leverage their SaaS offerings to bundle or tie their products, through which they offer preferential pricing conditions to customers and/or exclude competitors from the marketplace.

Figure 8: Market Share for SaaS



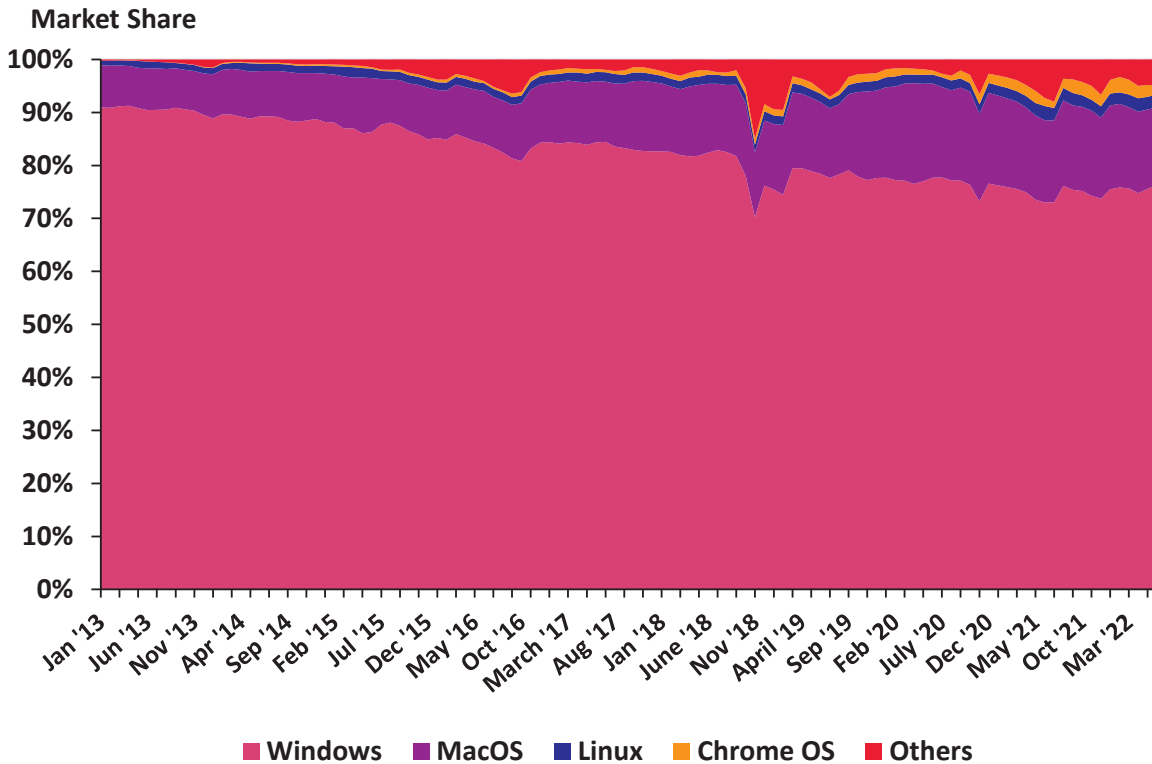
Source: Statista, Global cloud software (SaaS) revenue share 2015-2021, by vendor

139. Finally, as pertains to adjacent market segments, which include essential software components such as productivity software, operating systems and database management systems, the levels of concentration may be significant. For instance, in the Operating Systems (OS) markets, which represent an indispensable platform on which applications can be accessed and executed, Microsoft maintains a leadership position with approximately 76% share of the global operating systems market. Together with MacOS, with 15%, these two players account for 91% of the total market. As shown in Figure 9, it can be noted that this dominance has remained relatively constant over time, with other competitors (Linux, Chrome OS, etc.) demonstrating little success in increasing market penetration.

140. Similarly, in the office productivity software market, which provides end users with application software that directly support and optimise business functions, Microsoft's Office 365 remains the most ubiquitous service. In particular, Microsoft had a market share between 90 to 100% in the enterprise market for desktop productivity software in 2015, and continues to dominate this segment.⁸⁸ In absolute terms, it can be noted that Microsoft generated \$63.4bn in productivity and business software sales alone in 2022.⁸⁹

141. In this regard, players who exercise control in adjacent products, such as legacy software providers, may have an outsized and undue impact on the decisions of customers in the infrastructure segment. By engaging in actions intended to foreclose competitors from obtaining critical inputs to their IaaS services, or by bundling these with their own in-house solutions, these players have the ability to substantively restrict the contestability of cloud market segments. A theory of harm, outlining how foreclosure and bundling may translate into anticompetitive outcomes within the cloud computing context, is described in Section II.2.

Figure 9: Global Market Shares for Operating Systems in Desktop PCs



Source: Statista, Operating systems market share of desktop PCs 2013-2022, by month

Endnotes

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