Zero rating and end-users' freedom of choice:
An economic analysis

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Abstract: According to European Union Open Internet Regulation, commercial practices of Internet access Service Providers (ISP) should not restrict end-users' choice regarding services, applications or contents. This paper analyses the effects of Zero Rating (ZR) on freedom of choice translating this regulatory criterion into a formal expression: providing a ZR offer on a Content or Application Provider (CAP) restricts end-users' choice if it reduces the volume or provision of others usages. The analysis is made in two steps. Firstly, we assess the direct effect of introducing zero rating on non-ZR usages, all other things equal. Secondly, the paper studies the knock-on effect of ZR on ISP offers and the supply of CAP.
In the short term, zero rating does not restrict end-users' choice increasing both ZR and non-ZR usages. In the long term, in the case of pure ZR, ISPs may adapt their offer to support ZR costs impacting negatively other usages. However, in practice, these effects are compensated or diluted by competitive forces or if the ZR traffic is small relatively to the data allowance. In the case of SD, the CAP covers the cost which prevents cross-subsidies and protects freedom of choice if SD is open to all CAPs. The economic literature on zero rating is scarce and assesses this practice from the general economic criterion of social or consumer welfare. Our paper is the first one to use economic analysis to analyze whether Zero Rating is compatible with the EU regulatory criterion of freedom of choice.

Key words: Telecoms regulation, Net neutrality, Zero rating.

I.   Introduction

Zero rating is a commercial practice by which an Internet access Service Provider (ISP) does not charge the user for the internet traffic related to specific contents or applications, or categories of contents or applications, available on the Internet. The practice generally concerns mobile ISPs which propose limited or metered data plans. If an end-user has an unlimited data allowance, a zero rating offer has no additional benefit. Therefore, this practice is mostly found in mobile broadband services which, owing to underlying bandwidth constraints, are more likely to have data caps.

The provisions of European Regulation 2015/2120 concerning Open Internet do not explicitly mention zero rating, but provide general principles which guarantee an Open Internet, in particular concerning commercial practices and prices. Article 3 paragraph 1 provides that : *« End-users shall have the right to access and distribute information and content, use and provide applications and services, and use terminal equipment of their choice, irrespective of the end-user's or provider's location or the location, origin or destination of the information, content, application or service, via their internet access service.»*. Article 3 paragraph 2 specifies *« Agreements between providers of internet access services and end-users on commercial and technical conditions and the characteristics of internet access services such as price, data volumes or speed, and any commercial practices conducted by providers of internet access services, shall not limit the exercise of the rights of end-users laid down in paragraph 1.»* Recital (7) details what would limit the exercise of end-users' rights *« National regulatory and other competent authorities should be empowered to intervene against agreements or commercial practices which, by reason of their scale, lead to situations where end-users' choice is materially reduced in practice.»*

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[*] All opinions expressed are those of the authors and may not represent those of Orange.

The Body of European Regulators for Electronic Communications (BEREC) guidelines adopted pursuant to article 3 of the European Regulation mention zero rating practices in recitals 40 to 48 as a commercial practice which may impact the freedom of choice of end-users in the Internet.

According to the BEREC Guidelines, a zero rating offer where all applications are blocked (or slowed down) once the data cap is reached, except for the zero rated application(s), would infringe the principle of equal treatment between all internet traffic (Article 3 (3) of the Open internet regulation) and thus should be prohibited. Indeed, such types of offers which include differentiated traffic management in addition to zero rate pricing schemes have been banned.

However, when zero rating is purely a pricing practice and is not associated with differentiated traffic management, BEREC recommends a case by case analysis. It is up to National Regulatory Authorities (NRAs) to complete a multi-criteria analysis in order to assess the extent to which end-users' choice is restricted by the commercial practices of the ISP.

The objective of this article is to propose a single formal criterion characterizing whether or not such zero rating offers materially restrict end-users' freedom of choice in practice as defined in the open internet Regulation and more precisely explained in its Recital (7). In practical terms, it is the case when a zero rating offer favouring the usage of a content or application has the direct or indirect effect of significantly reducing the volume of usage of any other content or application and ultimately the supply of contents and applications. Indeed, freedom of choice of end-users cannot be considered to have been materially restricted if no content or application usage is significantly reduced.

The impact analysis will be based on economic reasoning enabling the formalization of how this criterion is directly or indirectly impacted by zero rate offers. To that end, this article makes a systematic analysis of the impact of zero rating offers on end-users' usage of contents and applications for a given ISP, on the allowance and prices of the ISP's offer and on the supply of content and applications.

The analysis is limited to net neutrality regulatory concerns. Potential antitrust issues related to zero-rate offers are not addressed. It also does not address ISPs' motivations to offer zero rating as the analysis is focused on the impact on consumers after they subscribe to a zero rating offer.

The analysis is made in two steps. As a first step, the paper will analyze the direct impact on all end-users' usages of adding zero rating for specific contents and applications to a given internet access offer (other characteristics of the ISP offer remaining unchanged). Whether or not such an addition has the effect of reducing the volume of usage of certain CAPs will be assessed.

As a second step, the paper analyses the potential knock-on effect of introducing zero rate offers, as defined in the first step, on Internet Access Service (IAS) pricing and the supply of content and applications. For this purpose, we will distinguish different forms of economic models supporting zero rated traffic: "pure zero rating", when the cost of zero rated traffic is supported by the internet access service provider, or "zero rating with sponsored data", when the cost of zero rated traffic is borne by the content or application providers. The impacts of situations of dominance or vertical integration are also addressed.

This two-step approach will allow us to study the direct and indirect impact of zero rated traffic on the volume of usage of content and applications, and therefore to assess the circumstances in which our formal translation of the regulatory criterion of safeguarding end-users' rights is satisfied or not.

The remainder of the paper is organized as follows: Section II reviews the existing literature on zero rating. Section III analyses the impact on end-users' behavior of the introduction of zero rating for a specific CAP on top of a given IAS offer, all other things being equal. In this first step, the economic wholesale model underlying zero rating will not be addressed. Section IV assesses the effects of zero rating on IAS prices and on the supply of content and applications. In this section, two economic models of zero rating are analyzed: "pure zero rating" or "zero rating with sponsored data", following the terminology explained above. Section V concludes.

II.   Literature review

The available literature on the analysis of zero rating can be divided into 2 sets: legal and regulatory, and economic.

In the legal and regulatory domain, the main sources are paragraphs 40 to 48 of the BEREC guidelines and the Belgian Institute for Postal services and Telecommunications (BIPT), the Belgian National Regulatory Authority (NRA) decision authorizing the "Tuttimus" offer of Proximus (a Belgian mobile network operator (MNO)). The BEREC report (2017) on the implementation of European Net Neutrality rules (BoR 17 (240)) underlines that most Net Neutrality cases addressed by National Regulatory Authorities concern zero rating offers. For the record, there is also the document by which the Federal Communications Commission (FCC) expressed concerns over AT&T and Verizon ZR offers in the USA and at the same time gave the green light to T-Mobile US ZR proposals. Although the FCC Chair stopped this proceeding, the reasoning is still worth reading. However, our work differs from these sources because we attempt to define a formal criterion for assessing the impact on end-users' rights, whereas the authorities use a case by case analysis with an informal approach depending on the authority and the context.

In the economic domain, the literature includes the following references.

B. Jullien and W. Sand-Zantman (2015), in their early working paper, analyze the specific case of sponsored data, and explain how sponsored data may improve welfare by solving the problem of the "missing price" when end-users consume services knowing neither their value nor the network resources they occupy. In their published paper (2018), Jullien and Sand-Zantman address a slightly different question and demonstrate that zero rating enables ISPs to screen contents and applications. This allows more traffic to be directed towards more valuable contents and applications. Due to the two-sided nature of the market and the fact that C&A are often free for consumers, the ISP internalized the consumer surplus in its decision: the potential negative impact of discrimination in the content side, if any, may be balanced with welfare benefits on the consumer side.

Robert Somogyi (2017) focuses its analysis on the impact of ZR on network congestion, considering network capacity as fixed. Axel Gautier and Robert Somogyi (2018) analyze two business practices, paid prioritization and zero rating when there is capacity constraint. They find that, when the value of traffic for CAP is limited, ISP's optimal policy is zero rating whereas when the traffic is high, the optimal practice is paid prioritization which is also beneficial for consumers.

Roslyn Layton and Silvia Monica Elaluf-Calderwood (2015) compare empirically the variety of applications available and used by consumers in countries where zero rating is banned and in countries where it is used. They observe that end-users' choice appears richer in the latter case.

Krämer and Peitz in a CERRE report (2018) focuse their analysis on the case for which zero rated traffic is throttled.

A broader literature on data caps offers a new explanation for why it is in the interest of ISPs to offer plans with download limits. Economides, N. and Hermalin B. E. (2015) demonstrate that ISPs, by offering Zero Rating, cause CAPs to lower prices or improve quality. This generates a higher consumer surplus, captured by ISPs via higher consumer prices.

Our approach is distinct from those of these academic papers as they assess the need for regulation in general, without being bound by a specific regulation and using the classical academic benchmark of social or consumer welfare instead of the Regulation-specific criterion of material restriction in end-users' freedom of choice.

Our paper adopts the point of view of regulation i.e. analyses the effects of zero rating on end-users once the ISP decides to offer this service. It does not address the reasons why zero rating offers emerge. In the field, the motivations for an ISP to offer pure zero rating without sponsored data differ from its motivation to provide zero rating subject to sponsored data. The motivation of an ISP to offer pure zero rating is to differentiate itself from competitors. Zero rating with sponsored data enables ISPs to provide to CAPs an instrument to develop the use of their service on the basis of their own private information on its value and costs.

III.   **Zero rating and end-users' behavior and freedom of choice : the short term effects in a given unchanged offer**

This section first defines the framework in which the direct impact of zero rating will be analyzed and then studies how the introduction of zero rating impacts the usages of zero rated or non-zero rated applications for a given IAS offer, differentiating between non-zero rated applications which may compete or not with zero rated applications.

3.1.   Analytical framework

This sub-section presents the modeled situation.

a) Modeling the inclusion of zero rated applications in a given IAS offer

As mentioned in the European Commission report (2017) on "zero-rating practices in broadband markets", zero rating practices can be divided into three main categories following the current practices in Europe:
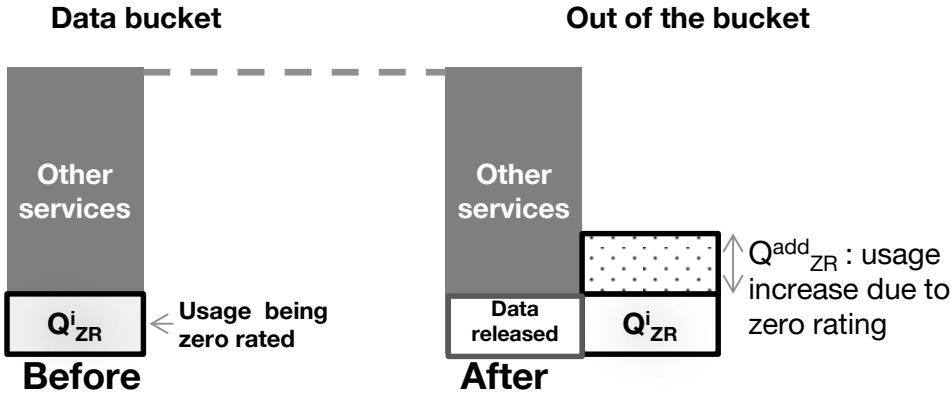   - "Bundled free": zero rating of applications that are generally free to access, with the charge for data usage bundled into a tariff. If there is a subscription for an application, it is not bundled into the tariff;
   - "Bundled subscription": zero rating of applications for which a subscription is required. Subscription and data charges are bundled into the tariff;
   - "Add-on": for an additional fee, the customer is given the option of zero rating certain contents or applications with unlimited usage. In some countries such as Bulgaria, operators offer add-ons that provide a finite data package. Strictly speaking, these offers are not considered as zero rating.

In this paper, zero rating is defined more schematically as the fact that the data allowance is not reduced by the internet access provider when its clients use the zero rated application. This simplification is without loss of generality as the different retail forms of zero rating trigger the same economic mechanisms on end users' freedom of choice.

In this first step, we analyze the introduction of zero rated traffic for an application or a set of applications in an IAS offer, all other things being equal: all other characteristics of the IAS offer, such as price or data allowance, remain unchanged. The knock-on impact of this introduction on IAS offers will be analyzed in a second step, in chapter IV of this paper, to obtain a comprehensive view of the direct and indirect effects of zero rating on end users usages and choices.

The situation which is considered is summarized in Figure 1 below.

Figure 1: Zero rated traffic introduced in a given offer

Once the zero rated traffic for the ZR application is introduced, the traffic corresponding to the consumption of the ZR application is not taken into account in the end-user's data allowance consumption. This may increase the data usage of this application.

The underlying economic model of zero rating (pure zero rating or sponsored data) is not considered in the first step of the analysis because it has no direct impact on the end-user behavior.

b) The choice of the zero rated application

Whether the zero rated service is chosen by the end-user or by the ISP is important when the criterion to be analyzed is the end-user's freedom of choice.

If the ISP lets the end-user freely choose the ZR application or if the choice of the potentially ZR application results from an objective selection process based on end-users' choices (e.g. choice of most-used applications by end-users, as in Proximus's proposal with its Tuttimus offer), customers cannot be considered as being restricted in their choices. The ISP does not distort end-users' choices, which are on the contrary reflected in the choice of the zero rated applications.

If the ISP selects a specific ZR application, this may influence end-users' choices: for instance, if the ISP proposes to zero rate the use of Spotify, customers who were using Deezer may wish to change their music and video provider as a consequence. But does this restrict end-users' freedom of choice, as compared to a situation where Spotify is not zero rated? This is what we are going to analyze.

The following paragraph discussing the impact of ZR offers on the volume of usage of ZR and non ZR applications only concerns the cases for which the choice of the ZR application is under the ISP's control.

3.2 Impact on usage of introducing ZR in a given offer

This sub-section analyses the impact of introducing a zero rated application in a given offer on ZR and non ZR usage.
To this end, we model the situation before and after the introduction of the zero rated application in the following way:
Before the introduction of the zero rated offer, the customer has an allowance of x Gbytes. She consumes this data bucket for the usage of the service which will be zero rated, for the services competing with the service which will be zero rated and for other services not competing with the service which will be zero rated.

After the introduction of the zero rated offer, the customer has the same allowance of x Gbytes. The consumption of the zero rated application may increase, as there is no longer any opportunity cost: consuming the zero rated application no longer reduces the allowance available for the use of other applications neither further use of the ZR application itself. As the consumption of the ZR application is no longer taken into account, the volume of data consumed when the ZR application was used is now available for other usages, which may be competing or not competing with the zero rated application.

The primary impact of the introduction of zero rating in a given offer is to reduce the unit data price as the customer pays the same price for more consumption. Not only is usage of the zero rated application increased, but so is usage of other applications in general, as they can benefit from the data previously consumed by zero rated service and made available in the allowance for other usages.

The following paragraphs will assess in more details the impact of introducing Zero Rate for specific applications on a given IAS offer, on the usage of zero rated and non-zero rated applications. Non-zero rated applications may compete or not with zero rated applications.

a) Impact of the zero rating offer on zero rated usages

The introduction of ZR has the following effects on zero rated usages. Using the zero rated application no longer generates an opportunity cost, as it does neither reduce the data allowance available for alternative applications nor for further use of the zero rated application. Therefore the usage of zero rated applications is likely to increase by a certain amount if the opportunity cost was previously a factor limiting the usage of that application.

This effect positively impacts the end-user's freedom of choice as it increases zero rating usage.

b) Impact of zero rating on other non-competing non ZR usages

The direct effect of the ZR offer on the non-zero rated usages which do not compete with it is that part of the data allowance which was consumed by the ZR application becomes available for alternative usages. The end-user has more data allowance available for these usages for the same price and can therefore increase their consumption. In that respect, the introduction of ZR has the same effect as a price reduction in a first step considering ISP offer unchanged (data allowance and price unchanged).
Another way of interpreting the same effect is that the introduction of ZR reduces the opportunity cost of the usage of these non-competing non ZR usages: using these services no longer reduces the

possibility of using ZR services. The constraint on using non ZR applications is reduced, as the data allowance available for non ZR applications is increased of the initial level of ZR usage. The effect on end-users' freedom of choice is positive, as it leads to an increase in these usages.

If the ZR offer consists of an add-on service, the result is the same, as the end-user can use more data from the general bucket for other services than the zero rated service, at the same price. The consumer chooses to pay to obtain unlimited data on the zero rated services but the reasoning remains the same, the consequences of the zero rating offer on non-competing non ZR services is to increase their usages.

c) Impacts on the usage of competing non ZR applications

This paragraph analyses the impact of introducing zero rating for an application of a given category (e.g. music streaming) on the usage of a competing application belonging to the same category (e.g. another music streaming service) which does not benefit from ZR. Our analysis distinguishes between equivalent usages shared by the two applications (e.g. identical pieces of music available on both applications) and differentiated usages between the two applications (e.g. music pieces available only on one platform) before analyzing the impact on the total usage of the competing application, including equivalent and differentiated usages.
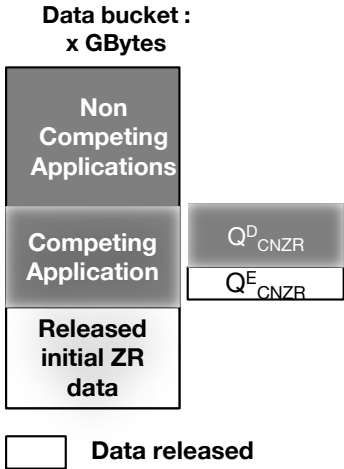
Impact of zero rating on equivalent usages of a competing application

The introduction of zero rating may potentially have a negative effect on equivalent usages, as there is no need for example to use both Deezer and Spotify to listen to the same piece of music, except if there were differences in the quality of the recording (in which case, usages would not be equivalent, but differentiated).

The end-user arbitrates between her possible preference for the non-zero rating application and the gain resulting from the release of data consumptions thanks to zero rating offers.

If the ZR application is used, equivalent usages in competing applications, which we note here Q^E_{CZR}, may then be reduced to zero. This reduction frees data consumption for other usages, as shown Figure 2.

Figure 2: Impact on usages of a competing non ZR application

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Impact of ZR on differentiated usages of competing applications

Hence the introduction of eero rating has two positive impacts on differentiated usages of Competing Applications, which we note here Q^D_{CZR}:
- First all equivalent usages transferred from non-ZR to ZR application is released for the benefit of differentiated usages of the competing application ;
- Second differentiated usages also benefit in addition to part of the released data allowance corresponding to ZR initial usage.

Therefore amount of data released which end-users have the choice to allocate to differentiated usages is mechanically larger than usage reduction for equivalent usage. As a consequence, usage of applications in competition with ZR services is likely to be enhanced, not reduced, by the introduction of ZR.

The outcome for competing applications will be positive if they are differentiated from ZR applications: in that case, the gain for differentiated usages will be larger than the loss for equivalent usages, the data allowance released for the former is larger than the data usage lost by the latter. It may be negative if applications are not differentiated, as equivalent usages will be larger than differentiated usages, the negative impact on the former will be larger than the positive impact for the latter.

The global impact on the end-user's choice is positive, as the end user would be quantitatively higher and qualitatively more diversified usage of contents and applications.

Finally, it should be noticed that any possible switching cost from the end-user's point of view can only mitigate all the effects described above, without changing their sign.

d) General conclusion on the impact of ZR on end-users' choice

Therefore the detailed analysis of the effects of introducing ZR on a given offer confirms the first presumption: it has a positive direct effect on all end-user's usages and potentially on its differentiation. Therefore it enhances rather than restricts the end-users' freedom of choice. This is essentially due to the fact that excluding ZR consumption from the data allowance increases the data available for alternative usages.

IV. Impact of zero rating on IAS offers and on supply of content and applications

In the first chapter of this article, prices and volumes corresponding to the IAS offer including zero rating were considered as given and were not affected by the introduction of zero rating. In this second chapter, we will analyze how the introduction of zero rating may in the long run influence the characteristics of IAS prices and volumes in the market. In particular, we will assess whether zero rating may increase the price or reduce the allowance of data available for non ZR services, reducing their usage and hence restricting end-users' choice. Then we will also identify whether the introduction of a ZR offer may negatively affect the variety of contents and applications supplied by CAPs, reducing the usage of non ZR content or applications and thereby ultimately restricting end-users' choice.

In this chapter, two types of ZR will be studied: « pure ZR » for which the ZR data traffic is financed by the ISP, and « ZR with sponsored data » representing the case for which the CAP providing the ZR

service fully pays the IAS for the data under ZR. We will study ZR impact on the ISP and the CAP supplies..

4.1. Pure Zero Rate

With the introduction of zero rating, the initial consumption Q^i_{ZR} and the additional ZR consumption Q^{add}_{ZR} is given for free to the end-user when compared with the initial situation. This consumption outside the allowance still represents a cost which needs to be covered by the price paid by the end user for the data allowance available for non-zero rated contents and applications, which could lead to potential mechanism of cross-subsidy.
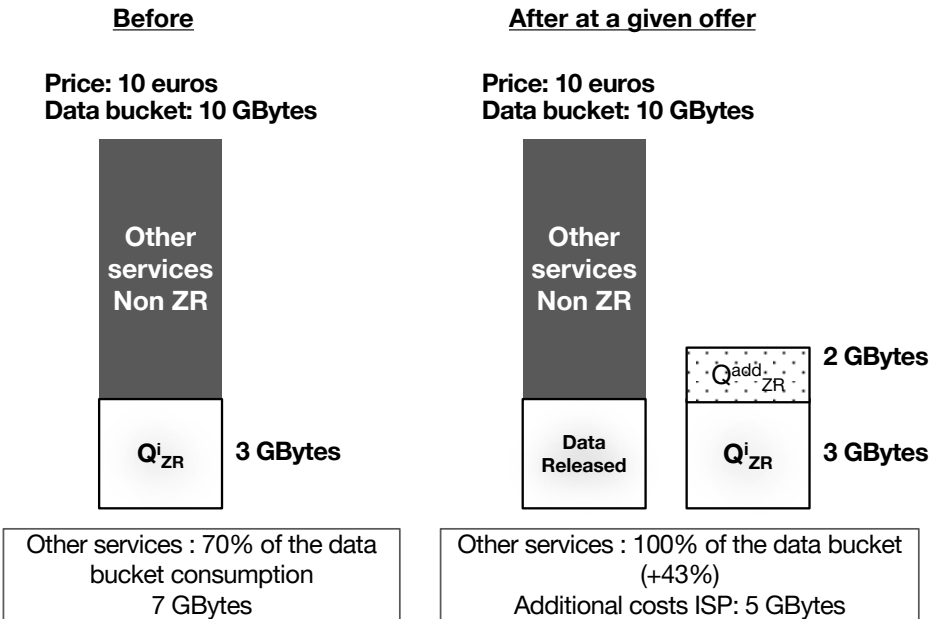
This is illustrated below in Figure 3 by a numerical example exhibiting the mechanism of cross subsidy between ZR and non ZR services. Firstly to simplify, we will consider that the market situation stays the same with no gain of market power.

To keep the reasoning simple, we will consider that the operator provides only one IAS offer on the market, and therefore that the compensation effects are observed on this single IAS offer. Let's take the example of a data allowance of 10 Gbytes at a price of 10€. This data allowance is consumed as follows:
- 3 Gbytes for the service about to be Zero Rated and ;
- 7 Gbytes for the other services.

Following the introduction of zero rating, the initial consumption of the ZR service of 3 Gbytes is no longer deducted from the data allowance. This allows an increase of the usage of the ZR services of, say, an additional 2 Gbytes. In addition, usages of non ZR services may also *a priori* increase up to 3 Gbytes within the data allowance, thanks to the fact that the initial 3 Gbytes of ZR service are no longer deducted from the allowance.

Figure 3: Sketch of the direct impact of ZR introduction

These increases of usages represent an additional cost for the ISP which has to be compensated, if the competitive intensity and therefore the margin remain constant in the IAS market.

The first step involves showing the modifications (volume and prices) to the IAS offer required in order to keep non ZR usages constant, to avoid extra costs.
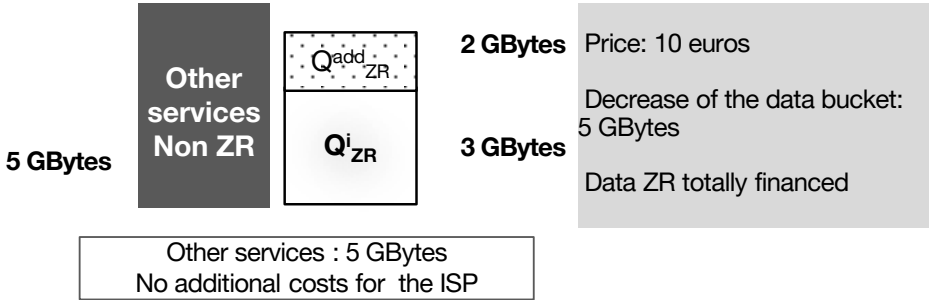Indeed, the ISP has two solutions to cover the extra costs of the implementation of the ZR offer:
- Decreasing the volume of the general data bucket;
- Increasing the price of the general bucket to take into account the extra costs.
Let's study, as a representative example, the case where the ISP decides to reduce the data bucket in order to compensate for the additional costs generated by a zero rating offer.

The first step involves defining the volume change which guarantees the same non ZR usage for the end-user. The former level of non ZR usage is unchanged if the data bucket is reduced from 10 Gbytes to 7 Gbytes for the same price (10 €). The end-user should be neutral to this change regarding his non ZR usages as she can keep the same consumption for the same price. She is, however, better-off in terms of global data consumption if ZR usage increases.

However, the ISP loses profits in this situation because the cost of the addition ZR usage freed up by the ZR offer is not covered. To fully compensate for the extra cost generated by the additional usage of the ZR service, the ISP would reduce the data bucket to 5 Gbytes which is less than the initial non ZR consumption as illustrated in Figure 4.

Figure 4: Impact of ZR on IAS offer to compensate additional ZR usages

As Figure 4 shows it, the compensation by the ISP for the additional costs of the ZR offer is done to the detriment of other usages: in this case, data allowance becomes lower than the initial non ZR consumption.

Illustrating the compensating effect on a single offer clearly shows the potential negative impact of pure ZR for other non ZR usages. The effect would be the same from the point of view of compliance with the Open Internet obligations if the compensation did take place on other IAS offers, even though it would be less visible.

The conclusion is the same whether it is the end-user or the ISP who selects the zero rated service. Even though pure ZR offers (in which the end-users choose the ZR application) do not raise concerns from the point of view of a limitation in end-users' choice (cf. section 2) they may, however, have restricting effects in the long run on the usage of non-zero rated services and ultimately on the supply of content and applications. These long run effects of ZR cannot be anticipated by individual users when they choose the ZR offer.

By negatively impacting the usages of non ZR services, pure ZR could in principle restrict end-users' freedom of choice, and for this reason, not be compliant with the Open Internet provisions of EU Regulation 2015/2120. However, this would be true to the extent that this impact is quantitatively

significant. This point is analyzed in further details in the following section and we demonstrate that this is generally not the case.

Conditions for pure Zero Rating to have in practice a material impact on end users' choices

This qualitative assessment detailed above should also take into consideration quantitative elements in application of the principle of proportionality of the EU electronic communications regulatory framework recalled in Recital (7) of Regulation 2015/2120 *"National regulatory and other competent authorities should be empowered to intervene against agreements or commercial practices which, by reason of their scale, lead to situations where end-users' choice is materially reduced in practice."* The actual impact of the above effects on the market may be benign or severe, depending on the market positions of the ISP and of the volume of ZR extra traffic compared to the data allowance. The European Commission report (2017) illustrates this by stating that *"Detrimental effects from zero-rating would typically require there to be market power at some level, or an agreement or concerted practice that creates a network of agreements, and competitors being unable to replicate the underlying arrangement."* The fact that this statement is included in a report dedicated to competition law aspects of zero rating does not reduce its truth concerning the actual impact of zero rating and therefore its relevance for regulatory analysis.

Under which circumstances, can a reduction of data allowance resulting from the introduction of pure zero rating be both material and sustainable?
A material reduction of data allowance, which would significantly impact the behavior of end-users, cannot be sustainable in a competitive internet access market. Alternative offers provided by competing ISP would propose larger data allowances. Only a dominant ISP in a non-competitive internet access market could unilaterally and sustainably impose such a data allowance reduction. In that such a case, this data allowance reduction would materially impact price and usage only if zero rated extra traffic represents a significant proportion of the data allowance.

By contrast, in a competitive access market or if zero rated additional traffic is small compared to data allowance, no material reduction of data allowance can be sustained, therefore non ZR data price cannot be materially increased, non ZR content and application usage and supply cannot be reduced, end-users choice is not materially restricted and ZR is compliant with regulation.

If the impact is not significant, prohibition would be disproportionate.

If the CAP is dominant and the internet access market is competitive, all ISPs may need to replicate the ZR offer. This could reinforce the dominance of the CAP and limits the offer of content and applications, which is detrimental for end-users' freedom of choice. But such a case would be better addressed via competition law than by Open Internet Regulation, which is neither designed to address ISPs collectively nor to address CAPs themselves.

4.2. Zero rating with sponsored data

Contrary to pure zero rating, zero rating with sponsored data provides revenues from CAPs to compensate the extra cost generated by the additional usage of ZR services.

Let's first detail the issue of sponsored data pricing.

Content Providers have the technical ability to adapt their service to the Sponsored Data price chosen by an ISP, for instance practicing higher prices or imposing more advertising to serve customers of ISP for which sponsoring data is expensive. If an IAS provider increases the sponsored

data price for CAPs, the CAPs which provide paid on-line services with sponsored data will increase their prices for customers of this ISP. And CAPs which provide "free" on-line services with sponsored data financed by advertising will increase this ISP customers' exposure to advertising. There is no need for those CAPs to have market power or to coordinate to act this way. It is just a trivial reaction to a variation of marginal cost in a competitive market. In both cases, paid or "free" on-line service, it reduces the CAP value for this ISP's customers and therefore its competitiveness in the CA market.

In other words, even though CAPs do not have direct bargaining power on ISP sponsored data price, they have both the ability and the incentive to pass-through sponsored data price variation in the price of their services to the ISP's end users. Therefore any variation in the sponsored data price will be mirrored on the end users' retail price (either monetary, or via personal data trading or through exposure to ads). As a consequence, sponsored data cannot be priced as a competitive bottleneck because price increases have a negative competitive effect on the ISP in the retail market.

ISP's market position vis-à-vis end-users equals its market position vis-à-vis Content providers. Therefore, its ability to price sponsored data above cost is equivalent to its ability to price IAS to customers above cost. Cost coverage by retail IAS price and by wholesale Sponsored Data price are therefore equivalent.

Neither a waterbed effect (related to insufficient price of sponsored data) nor an opportunity cost effect (related to excessive price of sponsored data) on non-zero rated services are likely to be observed. And at market equilibrium, the impact should be neutral on the IAS price for the use of non ZR applications.

Consequently, zero rating with sponsored data should not have any negative impact on the data price for non-zero rated services. Therefore zero rating with sponsored data does not restrict end-users' choice: neither by directly reducing their level of usage of non-zero rating services (as shown in section III), nor through a longer term increase in the price of data for non-zero rating usage (as shown in this section IV).

Hence ZR with open sponsored data should be considered as compliant with the European Open Internet Regulation.

In addition, all things being equal, transferring network traffic costs from the end-user to the content or application provider improves market efficiency. This is because the content or application provider knows the service value and controls the amount of traffic as necessary to supply the service, whereas this is not the case for the end-user. Therefore the provider is better placed to select the optimal level of production, taking into account the network utilization and the service value. Hence, the possibility for the IAS provider to sponsor the data generated by its service improves the functioning of the market **(Cf. Jullien, Sand-Zantman (2015)).**

If sponsored data is provided under bespoke contracts or vertical integration, if the concerned traffic is large and if either provider is dominant, this may raise competition law concerns, but no clearly identifiable Open Internet issue.

V.   Conclusion

This article proposes formal criteria and reasoning to assess whether zero rating offers support or restrict end-users' freedom of choice and as such comply with the Open Internet provision of European Regulation 2015/2120. End-users' freedom of choice is considered as restricted if and only

if the introduction of zero rating results in a reduction in the usage of non-zero rating services, through three channels: either directly through its impact on end-users' behavior, or indirectly through a relative increase in the IAS price for non-zero rated services, or through a reduction in the CA supply.

The main impact of the introduction of zero rated services for a given IAS offer is to increase the data allowance and to release consumption not only for ZR services but also for non ZR services. Detailed analysis of the impact on individual types of services does not modify this general conclusion. Therefore as such, zero rating does not have any negative direct impacts on end-users' choice.

Concerning the indirect impact on end-users' choice via the modification of IAS offers and the supply of content and applications, our analysis demonstrates that:

- Pure zero rating offers, where the cost of zero rated traffic is supported by the ISP, implies in principle cross-subsidy for the benefit of zero rated services generating a relative price increase for non-zero rated traffic. This relative price increase could in theory limit non ZR usage, thereby restricting end-users' choice. However, the end user will be materially limited in her choices if the ISP is dominant in the Internet Access market and if the additional ZR traffic represents a significant proportion of the data allowance available for end-users. However, if the ISP is not dominant or if the extra ZR traffic is small compared to the data allowance then the theoretical negative effects of zero rating will not be significant, and regulatory intervention would be disproportionate;

- Zero rating with sponsored data is neutral on the price of non-zero rated services and therefore does not impact the usage of non ZR services. In addition, it improves the efficiency of market functioning compared to a counterfactual without sponsored data as the CAP is better-placed to know its service value and can better control the load it imposes on the ISP network than the end-user. Hence, ZR with sponsored data does not restrict end-users' freedom of choice, neither directly through impact on end-user's behavior, nor indirectly through supply restriction.

Pure zero rating, if introduced for the benefit of a dominant CAP, or sponsored data, if provided under bespoke contracts or vertical integration involving a dominant provider, may raise competition law concerns if in addition the increase of the concerned traffic is large compared to the data allowance. However Open Internet Regulation is not designed to address such concerns. Such concerns are also outside the scope of this paper, which is limited to the analysis of compliance of Zero Rate offers with the Open Internet Regulation.

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