Chapter

Strategic Use of Zero-rating of Mobile Data

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Abstract

The digital economy, characterised by goods exhibiting high instantiation and low reproduction costs frequently created and distributed over multisided platforms, poses challenges for the pricing of products and services. As convergence occurs between applications and transport, flexible ways of pricing internet access and content are being developed. One frequently used pricing strategy is 'zero-rating'—where traffic for specific applications is not counted against the 'cap' in an internet user's monthly access plan. This pricing strategy has drawn much criticism from net neutrality advocates, but it is far from clear that the policy is harmful. Using an economic analysis based upon relaxing assumptions in the simple model of perfect competition, so that it more closely reflects the complex internet ecosystem, we assess the extent to which it is plausible for zero-rating to be used to harm competition, consumer welfare and incentives for application innovation. We develop five questions to assist inquiry into the potential harm or benefits arising, which can be applied by competition authorities, regulators and the firms concerned to assist in sorting the cases less likely to be harmful from those that warrant further investigation.

Keywords: zero-rating, economic analysis, regulation, competition, strategic interaction

1. Introduction

The digital economy, characterised by goods exhibiting high instantiation and low reproduction costs frequently created and distributed over multisided platforms, poses challenges for the pricing of products and services. Unlike for most physical goods, it no longer follows that the optimal price for any individual item will be a simple function of its cost of production, or even that the individual consuming the product or service should be the one that pays for it [1].

Information goods providers are increasingly adopting strategies subsidising the consumption of information goods by bundling them with other goods, or by utilising multisided platforms whereby revenues in excess of costs raised in transactions with customers of one product type (or side of the platform) are used to subsidise below-cost purchases by consumers of another product type (or side of the platform). For example, consumers receive 'free' (or discounted) newspapers, television and radio channels when advertising revenues offset the costs of providing the printing and broadcasting infrastructure required for the content to reach consumers. 'Virtuous cycles' arise as advertising revenues subsidise the costs of

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readers or viewers accessing content, thereby increasing consumer welfare, at the same time as having more readers and viewers increases the value to advertisers and hence the price that platform operators can charge them [2]. So long as there is careful balancing of demand elasticities on both sides of the platform, having prices varying from marginal cost on both sides can be both profit- and welfare enhancing [3, 4, 24].

Such practices have, however, proved particularly challenging for regulators and competition authorities entrusted with the pursuit and protection of competitive markets for the long-term benefits of consumers. Successfully engaging in above-cost pricing in at least one market requires the firm to have some degree of market power, while using the surpluses to subsidise another potentially alters the competitive dynamics in that market as well [5]. Inevitably, the interests of consumers of one product must be traded off against those of another. Furthermore, in the context of increasing disintermediation of once-integrated firms and their replacement by complex contractually co-ordinated supply chains for the relevant products and services, it is no longer obvious that one specific firm or even one market is the appropriate focus for attention. While a mandate clearly exists for competition authorities and regulators to be interested, it is far less clear that their historic precedents and inquiry methods based on historic structure-conduct-performance (SCP) models of industrial organisation established to deal with single firm or markets and non-information goods are suitable for governing commercial interactions in the new context.

The complexities are highlighted by 'zero-rating'. This occurs when internet service providers (ISPs) do not count the data traffic used to service specific applications (supplied typically by third-party content and application providers—CAPs—who may also be using advertising revenues to subsidise production costs) against the data traffic 'cap' allowed in an internet user's access (subscription) plan. Data transmissions for these applications are effectively 'free to the user', whereas data transmissions serving other applications incur an effective positive price. Regulators and telecommunication authorities in many jurisdictions have been required to adjudicate allegations of the use of zero-rating to harm competition in both the ISP and CAP markets, and thereby to cause harm to consumers collectively, and disproportionately to different consumer groups. Telecommunications regulators have been lobbied to impose rules prohibiting its use entirely, or at least permitting it only in very restricted circumstances.

To date, regulators and competition authorities have generally responded cautiously, by eschewing outright prohibition of zero-rating in favour of case-by-case analysis, as was explicitly required in the United States Federal Communications Commission's (FCC) subsequently repealed 2015 Open Internet Rule [6]. Following repeal, case-by-case jurisdiction has persisted under generic competition law overseen by the Federal Trade Commission, as occurred prior to 2015, and has always prevailed in countries such as Australia and New Zealand, where no specific net neutrality regulations have been introduced. In contrast, the European Union's approach, encapsulated in its 2016 Net Neutrality Regulation, is more prescriptive.

Nonetheless, even with case-by-case evaluation, regulators and competition authorities face many difficulties in assessing economic harms and benefits. Not least is defining the relevant market(s). Benefits and harms may accrue in multiple markets, many of which may be far-removed from both that in which the firm engaging in the pricing practice is deemed to be operating (e.g., in CAP markets not ISP markets) and the territory over which the relevant authority has jurisdiction (e.g., a CAP operating from a different country to the ISP). Further decision-making complications exist due to extensive use of bundling of internet and content access with other products and services (e.g., with fixed and mobile voice applications, and pay television, in classic 'triple' and 'quadruple' play subscriptions), and

the fact that little may yet be known about consumer valuations and preferences in markets for products that are comparatively new [7]. While the Body of European Regulators for Electronic Communications (BEREC) has endeavoured to address this complexity by issuing a set of guidelines for member state regulators to assist in implementing the European Net Neutrality Regulation [8], they have proven problematic. Their focus on legal compliance with the directive rather than detailed assessment of the economic harms and benefits in different circumstances has resulted in considerable variation between member state regulators' interpretation and application of the rule, creating both controversy and uncertainty about the acceptability of zero-rating pricing strategies across the notional single communications market to which the commission aspires [9].

Given the levels of economic complexity invoked by zero-rating, and the lack of theoretical and empirical evidence to date to inform both firms seeking to adopt the practice and regulators and competition authorities seeking to maintain fair and competitive markets (on balance, most that has been produced finds the practice NOT harmful), the development of some general economic principles for evaluating its effects is indicated. This chapter represents a first step in this direction. The contribution is five questions, which can be used as a preliminary filter to assess the likelihood of a specific instance of zero-rating being harmful to total welfare, thereby necessitating either caution on the part of a firm potentially implementing it, or justification on the part of competition authorities and regulators contemplating expending their scarce resources on a more intensive investigation.

We begin by outlining the general arguments for and against the use of zero-rating. Next, we summarise key economic characteristics of the internet ecosystem in which zero-rating offers are being made. Then, beginning with the models of perfect competition upon which theories of competitive harm were developed in classical SCP thinking, we demonstrate how successively relaxing the model assumptions when it is applied to the commercial interaction between ISPs and end users leads to the identification of circumstances where zero-rating may be more or less harmful to total welfare. The theoretical economic methodology used for this inquiry draws upon and extends the similar approach used by Greenstein et al. [21] and Gans and Katz [10, 11] in their inquiries into specific examples of zero-rating. The result is the five questions, which are summarised in our conclusion.

2. Zero-rating, net neutrality and competitive harms

Calls for the banning of zero-rating offers have arisen in the context of wider advocacy for increased regulation of ISPs to impose a particular view of an internet where ISPs are required to treat every data packet equally—in regard to both technical and financial characteristics. Calls for ISPs (but not the providers of content and applications used on the infrastructure) to operate in this neutral, non-discriminatory manner—so-called net neutrality—derived from Wu's [12] seminal paper.

Particular concerns have been voiced about ISPs charging some content and applications providers (CAPs) but not others to deliver their traffic to end consumers, even when those payments are not associated with traffic prioritisation (so fall outside the so-called 'hard' network neutrality regulations [13] precluding such behaviour). ISPs, however, are continually looking for new revenues in order to finance the newer, more capable networks required to transport a burgeoning volume of content and application data between CAPs and end users, in addition to winning new customers and amortising general network costs.

Some neutral internet proponents (e.g., [14, 15, 28]) have argued that 'zero-rated' internet access plans, frequently offered by mobile providers, should be prohibited.

These plans do not count data used for selected ('zero-rated') applications against the data downloading 'cap' specified within the monthly access fee. End users face a lower effective price for using the selected application than for other applications that are not 'zero-rated'. The ISP may or may not charge the selected CAPs to recover the costs of delivering their data to end users. 'Zero-rated' plans are seen by net neutrality proponents as a form of unfair price discrimination[1] against those internet users who do not access the selected content. It is also argued that when ISPs selectively zero-rate data relating to large established CAPs, smaller and newer rivals will be foreclosed, thereby harming incentives for application innovation, regardless of whether or not ISPs charge CAPs. A further argument is that application variety will be harmed because smaller, newer providers may not have the resources to pay ISPs to zero-rate their traffic, leading to their applications being eschewed by end users preferring the zero-rated options.

Others, however (e.g., [10, 16, 17, 25, 27]), contend that preventing all instances of zero-rating will necessarily rule out some cases (e.g., those analogous to advertising in newspapers) where payments on both sides of a two-sided market may be necessary for both an application and the additional infrastructure needed to service demand for it to be commercially viable in the first place. They also suggest that zero-rating will facilitate higher internet use in total (and therefore higher welfare) than if payments were restricted to only one 'side' of the internet platform. The potential welfare gains from higher internet use may be especially valuable in developing countries where the ability to pay for additional data use is very low [18]. They argue for a more nuanced approach, where each case is considered on its merits, so that the interests of all participants in highly complex internet-enabled ecosystems can be assessed [9, 19, 29, 30].

To date, no consistent view has emerged amongst regulators and competition authorities of what constitutes anti-competitive use of zero-rating. In the United States, much press has been directed at T-Mobile's zero-rating of its Binge-On application, but the FCC has found no harm. In Europe, the Belgian regulator found Proximus use acceptable according to the BEREC guidelines [31], and two National Regulatory Authorities (NRAs)—Austria and Croatia—found zero-rating acceptable when assessed against BEREC's commercial criteria. However, the Dutch NRA found Deutsche Telecom had infringed in zero-rating its free music service. The decision was struck down on appeal, but on grounds that the NRA decision exceeded EU law, rather than on its commercial merits.[2]

3. The internet ecosystem and zero-rating

Zero-rating offers take place in a complex internet-enabled ecosystem consisting of multiple intertwined two-sided platforms, of which ISPs are just one of many in the commercial chain linking senders and receivers of data [20, 21, 32]. **Figure 1** illustrates how in this ecosystem, payment flows need not necessarily follow data flows. The systemic interaction of payments and data flows means that actions at any one segment of the ecosystem can have material consequences at any other part.

[1] A distinction needs to be made between legal definitions of discrimination—where two people with observable differences are treated differently (e.g., racial or gender discrimination) and economic discrimination—where two people with different economic characteristics are treated differently (e.g., where those with low willingness-to-pay are charged a low price and those with high willingness-to-pay a high price). The latter case may frequently lead to a more efficient outcome. However, in the former, the individuals may have identical economic characteristics, so charging different prices is not welfare-enhancing.

[2] Autoriteit Consument & Markt, "ACM Not to Appeal Ruling on Net Neutrality | ACM.Nl," News, May 23, 2017, /en/publications/publication/17267/ACM-not-to-appeal-ruling-on-net-neutrality.

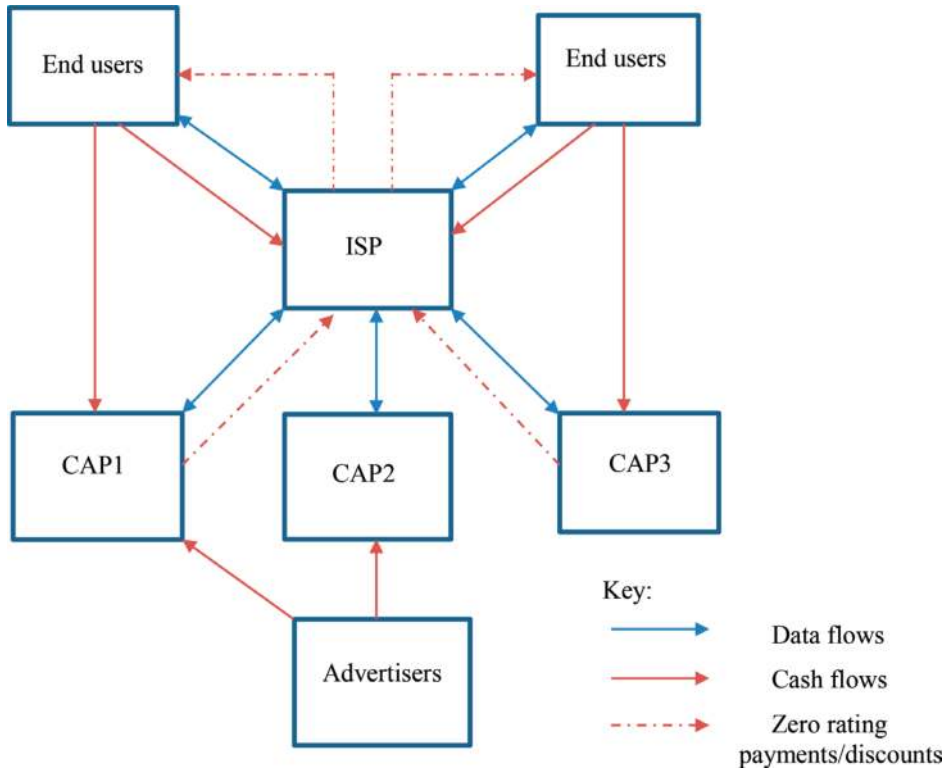

Figure 1.
The internet-enabled ecosystem.

3.1 Complex interactions

Net neutrality advocates assert that innovation at the CAP 'edge' of the ecosystem unconditionally dominates innovation at the ISP core. In this view, ISPs' sole commercial functions are to serve the internet data transmission requirements of their end users. ISPs should not have commercial interactions with CAPs—thereby precluding any possibility that selected CAPs can pay ISPs to prioritise (i.e., discriminate against) traffic related to their applications over that of their rivals. By extension, any arrangements whereby ISPs discount the charges relating to specific applications (i.e., zero-rating) are seen as price discrimination. Both practices are seen to discriminate amongst CAPs, so are antithetic to the objective of promoting the internet ecosystem as an engine of innovation [22]. Van Schewick [15] uses this argument to question the efficacy of T-Mobile's zero-rating of content on Binge-On, as do critics of Facebook's Free Basics. Indeed, Lemley and Lessig go so far as to suggest that ISPs should not charge CAPs for data delivery as a form of subsidy for application development activities.

In contrast, ISPs claim that they have been required to build ever-more-capable networks (for example, from 2G to 3G, 4G and now 5G mobile, and fixed fibre and wireless) to serve the vastly increased demands placed on them to deliver ever-larger amounts of data at ever-faster speeds to meet the demands of specific applications [26]. A handful of application types—notably audio and video streaming—require vastly more sophisticated network capabilities than others—for example, simple websites. As not all consumers use these applications equally, and some applications—for example, those relating to time-critical bilateral interactions—need to be treated differently from others—e.g., one-way streamed data—then some degree of discrimination (both in terms of traffic management and pricing, such as charging CAPs in some instances as well as ends users) is essential if their networks are to be operated efficiently and effectively.

Regulators and competition authorities are charged with promoting competition in each of the relevant markets in order to protect the long-term interests of consumers. This dynamic welfare criterion is predicated upon the assumption that the long-term interests of consumers in each of these markets are a suitable proxy for the long-term interests of the ecosystem as a whole. Thus, balance is required between short-term and long-term factors. Furthermore, what is optimal at one time of the ecosystem lifecycle may not be optimal at another [33, 34]. To the extent that social preferences may override the economic considerations, then the costs of imposing those preferences must be recognised in both the total welfare foregone, and the transfers that those preferences engender between ecosystem stakeholders. Moreover, a single stakeholder may participate in the ecosystem in multiple capacities, and these may vary over the ecosystem lifecycle. The dilemma for regulators and policy-makers is to decide what to take into account when developing a framework for assessing cases of zero-rating, and deciding how and when to intervene.

3.2 Derived demands

The dilemma is exacerbated because end-users' demands for ISP services are not determined solely by their own interaction. An ISP connection is of no value to an end user if it is not used to access internet applications. ISPs operate two-sided platforms connecting CAPs and end users. The relevant products for any zero-rating inquiry are the complex bundles of internet access and application use that end users consume. Internet connection value cannot be considered in isolation—it is dependent upon the value the consumer places on the applications accessed. The ISP may supply some of these applications, but for the most part, consumers' value of the connection is contingent upon being able to access a vast range of applications provided by third-party CAPs.

A nontrivial observation arising is that, for the most part, ISPs do not have strong incentives to impede their consumers' access to the preferred applications, for fear of losing them—and their revenues—to rival ISPs [21]. If favouring one application harms access to or use of another, then likewise this will likely reduce both the number of ISP customers and the ability of the relevant CAP to earn subscription and advertising revenues. Ipso facto, this reduces the incentives for ISPs to use pricing to strategically foreclose selected third-party applications—especially those consumers valued highly—unless they are compensated by the CAP. However, as the market power (measured by the consumer base) of highly valued CAPs vastly exceeds that of any individual ISP, and they have very wide (global) reach whereas ISPs are geographically specific, it is most unlikely that they will engage in contracting in each of the vast number of local geographic ISP markets in order to foreclose their CAP rivals. It cannot be discounted that locally specific CAPs might find such a strategy advantageous with regard to a rival facing the same geographic limitations.

3.3 Complex tariffs

ISPs can charge consumers a flat fee, a usage-based fee or a combination of the two for internet access. Consumers' internet access purchases are determined by trading off the fixed price paid for access and any usage charge against the benefits of accessing and utilising applications. Menus of two-part tariffs bundling access and usage charges are generally welfare enhancing relative to a single flat-rate or solely usage-based tariff as they allow users with different valuations associated with different usage levels of even a single application to self-select the tariff that gives them most surplus [35].

A zero-rated tariff applied to a specific application is simply a tariff with no usage-based component—that is, a flat fee. Flat fees are most advantageous for those with the highest expected usage, (e.g., video gaming) as they will utilise it up to the point where no further benefits will be obtained. This is necessarily more than if usage is charged at marginal cost (noting that network congestion is a significant externality proportional to utilisation that is imposed by users when utilising applications). If the higher costs associated with higher usage levels are to be recovered in user fees, a single flat-rate tariff will be higher where usage is higher that when it is lower. Metered tariffs (including plans with flat-rates within a given data cap, that rise as the data cap increases) are an efficient means by which ISPs may recover revenues from each consumer rising in proportion with the costs that usage imposes on the ISP (including the costs of congestion that lower service quality for all users).

3.4 Heterogeneous end users

However, metered tariffs will arise in practice only if consumers are heterogeneous in their valuations of application usage. If all consumers value their connections identically, then there will be one tariff that is efficient for all users, and there will be no incentive for ISPs to offer any other tariff. Consumers' valuations of internet application usage are inherently heterogeneous because different users will prefer to use different applications for different purposes. Some will prefer applications requiring high usage (e.g., video streaming) while others will prefer applications with lower resource demands (e.g., web browsing, email). Even consumers preferring a single application will vary in their use of it due to personal preferences and resource constraints—for example, time to watch streamed video and the cash to pay for the connection.

Consequently, internet access as sold by ISPs is not a homogeneous good—it varies with the application preferences of the consumers using it. Consumers with higher valuations for a single application will consume more resources than those with lower valuations. If metered tariffs are intended to recover higher revenues from higher-using consumers of a single application, then offering a zero-rated tariff for that application is inconsistent with the ISP's objective to recover its costs in usage fees. Assuming that the ISP does not recover the revenues lost from zero-rating application usage from the application provider, and it costs the same to deliver a unit of each application to the end user, then it is strategically illogical for the ISP to charge for the usage of one application and zero-rate usage of the other. Costs remain unchanged, but revenues will fall.

Hence, in the simplest case, as zero-rating by an ISP discounts revenues received from selected end users on the consumer side of the ISP platform, it must necessarily be associated with compensatory revenue streams—for example, higher fees charged to non-selected users, charges on the CAP side of the platform, or revenues from other sources, such as taxation or advertising—if in the long run the ISP wishes to remain solvent.

4. Competition: relaxing the assumptions

The principal arguments against zero-rating promulgated by net neutrality advocates rest on the one-sided logic that all end users should pay the same price for internet access, regardless of whether the market for the product in question conforms to the assumptions of perfect competition. In this model, the marginal unit supplied will be sold at its marginal cost of production, and this cost will determine

the price paid for all other units sold. This leads to a statically efficient outcome, with maximum total welfare.

However, for this to be achieved, other specific market conditions must be met. Importantly, the product sold must be perfectly homogeneous, there must be perfect information, no transaction costs, no externalities, and no barriers to firms entering or leaving the market. There must be perfectly divisible output (i.e., no scale economies). All participants are price-takers—that is, no firm can charge more than the efficient price and remain in the market, and consumers must pay that price if they value the product at that price or above.

Requiring all units to be sold at the same price does not of itself make a market more competitive (i.e., render the perfectly competitive outcome) unless all of the other conditions are met. In this section, we will demonstrate that as practically none of these assumptions prevail in the complex market for internet access discussed in the previous section, simplistic calls to prevent zero-rating are insufficient to guide decision-making.

First, we show that when the assumption of homogeneous goods is relaxed, it is most unlikely that zero-rated tariffs can be used to foreclose rival applications. Instead, we demonstrate that requiring the same price to be charged for accessing products costing different amounts to produce obscures crucial underlying differences in costs on the supply side and user preferences on the demand side. This leads to our first three questions to be posed by those undertaking case-by-case assessments of zero-rating examples. Next, we relax the assumptions of perfect information and absence of transaction costs in the exchanges between ISPs and their end consumers, and their effects on barriers to entry for new CAPs and ISPs. This leads us to question the competitive positioning of the party objecting to an ISP using zero-rating prices—and our fourth question for assessors. It also leads to our final consideration—how the presence of transaction costs creates barriers to entry that lead to entrants and not incumbents favouring zero-rating policies. This leads to our fifth question, regarding the strategic options available to CAPs and ISPs that render financial transactions between them an adjunct to zero-rating that makes the strategy not only pro-competitive but also welfare-enhancing.

We note that in this analysis we are considering only instances of pricing of data transfer as a strategy for zero-rating. We do not consider cases of payments for data prioritisation. The examples we consider therefore have the appearance of the price discrimination to which Wu [12] and Van Schewick [15] raise objections, rather than being artefacts of paid data management, which are considered in other literature.

4.1 Relaxing the constraints: homogeneous products and heterogeneous users

In net neutrality discourse, ISPs could strategically zero-rate a selected application to steer end users away from using another application and towards the favoured one. This could occur if the ISP is also the CAP for the favoured application, whereby it could foreclose another ISP offering a similar application, or to foreclose a rival stand-alone CAP. However, such foreclosure can only occur only if the end users perceive the applications as perfect substitutes: that is, the applications are homogeneous.

If the two applications offer materially different value propositions to end consumers (i.e., the assumption of homogeneous products in the perfect competition model is relaxed), then the zero-priced application will not be able to force the positive-priced one from the market so long as there are consumers who prefer the positive-priced one over the zero-rated one by more than the discount embedded in the zero-rating offer [11]. As demonstrated above, as end users are also

inherently heterogeneous in their content preferences, it is quite unlikely that the requisite conditions for foreclosure will occur unless the applications concerned are indistinguishable.

The inability for 'free' offerings to foreclose those with a positive price is observed with broadcast television and newspaper providers. Free-to-air television and free newspapers have not foreclosed pay television and newspaper subscriptions. Indeed, some consumers willingly consume both, even when some of the content overlaps, because the additional value offered by the pay version is sufficiently high enough that it overcomes the price differential. Arguably, the presence of the two different newspaper forms has led to greater content variety, with subscriber newspapers providing a professional journalist-based news service, and free newspapers relying more upon content generated by readers (e.g., local school and sports reports) and advertisers.

This leads to our first question to be posed about zero-rating offers.

Question 1. What very close or perfectly substitute applications accessible over the ISP's connection, costing the same to deliver, are likely to be foreclosed by the zero-rated application(s)?

The closer are the non-zero-rated application(s) to the zero-rated one(s) in the perception of the end users, then the more likely it is that the non-zero-rated applications will be crowded out. However, there are very few applications meeting this requirement that are truly close substitutes. For the most part, CAPs such as Netflix and Hulu are not close or perfect substitutes for each other because they contain different bundles of content for which end users have distinct preferences. The applications themselves are differentiated; even if it costs the ISP the same to deliver a Hulu movie and a Netflix one of equivalent specifications. If a consumer preferring Netflix is not prevented from paying the higher usage fee to watch Hulu content if the content available only on Hulu is sufficiently highly valued, then Hulu will not be foreclosed, even in respect of the subset of Hulu-preferring consumers on the discriminating ISP's network.

It might be a concern, however, if the applications in consideration were, for example, two identical cloud storage applications. The zero-rated application will have an unequivocal advantage over the non-zero-rated one, leading to all consumers with a non-zero valuation of using cloud storage opting for the lower-cost one. However, for foreclosure to occur, it is necessary for the applications to be undifferentiated—that is, homogeneous products. Foreclosure of differentiated products will be a function of the degree of differentiation—the more similar they are, the more likely it is that foreclosure will occur.

The logic applied in this simple illustration leads to the conclusion that without some non-neutral pricing signals, over-much (inefficient) investment in CAP variety is possible if equalising the prices faced by consumers and application providers conceals underlying real differences in costs and user preferences.

4.2 Equalising prices conceals underlying cost and valuation differences

Assume now that the two applications are perfectly homogeneous, but one actually costs less to deliver than the other. This could be because the ISP has been able to customise the delivery of one application within its own networks so that it costs less (or causes less congestion) than an otherwise-equivalent one that has not been customised. It could also be that one class of applications can be processed via a different operational process that is less costly, as occurred in Australia and New Zealand in the mid-1990s, when the internet was first becoming popular. At the time, international bandwidth capacity on the PACNET sub-oceanic cable was constrained. Due to asymmetric data flows, Australian and New Zealand ISPs

purchased PACNET capacity under transit arrangements rather than peering. Traffic to and from end consumers over PACNET was more costly to handle than traffic handled under local peering arrangements. The original retail internet plans metered international (PACNET) traffic by volume, but offered unmetered (i.e., zero-rated) local traffic.

In this instance, zero-rating low-cost local traffic but metering high-cost international traffic reflected real differences in underlying costs. Zero-rating that diverts consumers' usage of substitutable applications towards lower cost applications raises efficiency.

This leads to our second question for regulators and adjudicators.

Question 2. Does usage of the zero-rated applications actually cost the ISP less than equivalent usage of non-zero-rated applications?

If the answer to this question is 'yes', then zero-rating would be less harmful to total welfare than the alternative of requiring all usage to be charged at a single price. Under the two-price arrangement, more usage than efficient would be made of the low-cost application, and the high-price usage tariff would have to be above cost to subsidise the additional low-cost usage. Arguably, this could lead to some low-cost applications surviving that would not otherwise be viable if their usage was charged at cost—that is, inefficient over-supply of application variety [11].

However, the alternative of a single positive usage price that does not signal the different underlying costs will lead to more usage of the high-cost application than if it was charged at cost. This usage would have to be subsidised by users of the low-cost application. Increasing the price of using the low-cost application above its cost to subsidise the high-cost usage leads to less usage of the lower-cost application, and at the margin some consumers will give up their internet connections entirely because they no longer receive utility higher than the combined price of access and usage. Without the fixed revenues of these low-cost consumers to offset the higher usage costs of the consumers paying below cost, the average usage cost per unit of traffic handled increases, leading to even higher usage fees and a second depressing effect on the usage of and fees generated by low-cost users. That is, a 'waterbed effect' emerges [23].

Hence, zero-rating of applications with lower costs than non-zero-rated applications is not equivalent in its effects to zero-rating applications with the same costs as their zero-rated counterparts. The difference is material. In a perfectly competitive market, it is necessary for the price signals associated with lower costs to be sent to consumers so that efficiency-raising changes in purchasing behaviours can take place. Concealing information about cost differences (e.g., by averaging the prices for two or more applications) prevents consumers making efficiency-raising choices.

We note, however, that in the New Zealand case, discounting local applications did not crowd out content from foreign origins because they were not substitutes. Indeed, foreign content and applications were overwhelmingly preferred by end users, even though they were more costly.

4.3 Differentiated price and product offers to low-valuers

We now turn to the argument of pro-net neutrality advocates that zero-rating should not be allowed when it enables free or discounted access to a narrow range of internet applications or applications with some functionality removed, when the ISP charges a higher fee for unrestricted access to the 'full service' applications. This restriction is claimed for ISPs, even though the same practice is widespread in the software industry—for example, Microsoft's Office available as a low-price, restricted student version and a high-price, full service professional version.

The advocates claim that restricted offer users cannot participate equally with unrestricted users in a supposed 'right' to access the full potential benefits of all

applications and content available on the entire internet. Any arrangement that allows differentiated access to that content is seen as an infringement of that right. Zero-rating that reduces access charges in exchange for reduced functionality is therefore 'unfair discrimination'. Free Basics, where potential internet users in developing countries are offered free access to a restricted range of applications, but can access the full versions when paying a monthly internet access subscription, is frequently cited as such an infringement.

In principle, zero-rating access to a restricted-functionality application is no different to an application provider choosing to make some content available freely, and releasing other content only when some other obligations—for example, paying a fee, or sharing personal information—have been met. Access providers can set different tariffs for using different versions of the application if they really do invoke lower costs (e.g., stripped-down versions with lower data consumption), as per question 2. However, these versions may also be associated with compensation from the CAP to the ISP, especially if the low-cost version stimulates more low-value consumers to purchase connections, increasing the value available to the CAP from advertising. Furthermore, it is the application provider and not the ISP who makes the decision about restricting the application range to self-selecting end users. Preventing application providers from offering these discount arrangements appears at odds to the net neutrality argument that edge providers and not ISPs exercise control over internet content. If the range of content is restricted by applications providers—for example to foreclose other application providers—then it would seem more properly a matter to be addressed by generic antitrust provisions rather than internet access regulation.

Moreover, the presumption that all end users should pay identical prices to access the same applications ignores economic realities. The expectation that all consumers pay the same price for a product is an artefact of perfectly competitive markets. If all consumers pay the same price, then those with higher valuations of the bundle receive more surplus than those with lower valuations. Perfect equity in access prices for homogeneous good cements in place extreme inequities in surplus distribution. Price discrimination (different prices for the homogeneous good) effectively transfers surplus from high-valuers to low-valuers and leads to higher total consumer numbers without reducing total welfare. Where scale economies are present (as occurs in both ISP services and most CAP products, as they are mostly digital products with near-zero reproduction costs), then total welfare increases as well. Product differentiation (e.g., offering a subset of functionality for a lower price) leads to higher consumer numbers in total than with a single price for the undifferentiated good. Price discrimination and product differentiation therefore both appear consistent with (or at least are not per se harmful to) increased product variety, larger total numbers of internet users and ongoing innovation in the internet ecosystem. That does not mean that the practices might not, in some circumstances, lead to negative outcomes. Rather, it reinforces the merits of a case-by-case analysis rather than prescriptive prohibitions.

Price and product differentiation are important ways of enabling individuals with low valuations of internet use, or facing significant financial constraints, to become internet users, The former case occurs in mature markets, when the last-remaining individuals have not yet connected because the value they place on the connection is less than even a very modest single price charged. The latter case arises in developing economies, where income constraints pose significant barriers to purchase for large numbers of individuals. While subsidising connection fees through a tax and redistribution system may induce purchase in the former group, subsidising via applications may be more effective because the application is the primary determinant of the value derived. It also offers a superior means of

subsidising in the latter case, because surpluses generated by users in developed economies can be transferred via the application and access bundle to subsidise those in developing economies. Thus, wealth transfers across national borders can occur without the need for government intervention.

This gives rise to our third question for regulators and adjudicators.

Question 3. Is zero-rated access to a subset of applications primarily intended to increase the number of individuals using the internet?

The purpose of this question is to separate out instances of zero-rating that are more likely to lead to positive network effects arising from larger total numbers of internet connections from instances that may arise from other motivations—for example to change the range and usage of applications by individuals already purchasing internet connections.

4.4 Relaxing the constraints: perfect information and no transaction costs

Having considered the implications of relaxing the constraints of product (and consumer) homogeneity, we now turn to the assumptions of perfect information and zero transaction costs that attend the perfect competition model, and their effects on barriers to entry and exit.

Imposing the assumption of consumer homogeneity reduces the amount of information available to both ISPs and CAPs to customise their offerings to individual consumer preferences. Information that would otherwise have been efficiently signalled or screened in customised offers can only be obtained subsequently by other means—inevitably with higher transaction costs. In the long run, this would seem to impose impediments to, rather than incentives for, the development of new applications and contracting arrangements. That is, banning zero-rating because the practice may pose entry barriers for new application providers must be balanced against the entry barriers that will be created if information about underlying consumer heterogeneity that would be efficiently signalled, screened and shared if zero-rating proceeds cannot emerge due to regulatory intervention banning the practice.

While banning zero-rating has been justified by the potential for ISPs to raise the costs for new application providers, it is equally plausible that banning prevents both application developers and ISPs from learning about and creating offers that cater to these underlying differences. Thus, existing ISPs and CAPs might prefer the information not to be surfaced if in doing so, opportunities were created for new entrants to take advantage of consumer heterogeneity to create new offers, attract consumers away from the exiting providers and appropriate a disproportionate share of the new consumers yet to purchase internet connections. Likewise, existing end users obtaining high surpluses under a single price might be unwilling to share those surpluses with new consumers who will participate only with implicit subsidies.

This gives rise to our fourth question for regulators and adjudicators.

Question 4. Who has requested that an instance of zero-rating be investigated?

If the request has come from existing ISPs, then it is plausible that the motivation may be to foreclose competitive entry by rival ISPs. If it has come from existing CAPs, then the motivation may be to foreclose competitive entry by new applications provides. If it comes from existing end users, then the motivation may be to lock in existing surpluses and not have to share them with new or future internet consumers. On the other hand, if the request to investigate has come from new or potential ISPs or CAPs then the claim that it creates an entry barrier may be credible. It seems most unlikely that a non-end user would ask for an inquiry about the legality of a zero-rating offer that would cost less than the alternative price. Similarly, it is also unlikely that a low-valuing existing end user who would be better-off using the restricted zero-price offer would request an inquiry.

4.5 Positive search costs and barriers to entry

In markets with heterogeneous products, consumers with different preferences, and information asymmetries that make it costly, if not impossible for consumers to identify the attributes of the products or the fit with their preferences before they have been consumed, a more appropriate model for analysing interaction is monopolistic competition. In this model, within a range of products there will be one that will be the best match for a given consumer with given preferences. At any given price, this product gives the consumer the highest possible surplus.

However, the consumer cannot identify in advance, which is the best match. Nor can the provider accurately identify the best consumers for the offer. The consumer can select one offer at random—so long as the surplus from this purchase is not negative, the consumer has gained at least some increase in surplus. Where the consumer will use a service multiple times (or make multiple purchases), the gain from purchasing the same product/service is known. There may be a better match available (higher gain) from buying a different product next time—but there is also a risk that the different product is a worse match than the existing one. The consumer could have had higher surplus if instead the first product had been purchased. There may also be switching, learning and adjustment and other investment (transaction) costs associated with each product. Buying from a second supplier means a second set of these costs—which is avoided if second and subsequent purchases are made from the first supplier. Together, these comprise 'search costs' (a form of transaction costs). The larger are the search costs, and the smaller is the expected benefit of the second product over the first, the less likely it is that the consumer will try to find a better match, even though there is definitely a better one out there. Thus, high search costs lead to suppliers having some market power over their existing customers—akin to monopoly—even though there are many different variants of the product—competitors—available for consumers to choose from.

Almost certainly, the markets for internet application adoption and usage are monopolistically competitive. Customers make investments in using specific applications (learning costs, emotional investments, etc.) that make them reluctant to try new variants. When a new application enters a market where customer preferences are already well established, overcoming these high search costs is likely one of the most significant barriers faced. The more mature is the application market, the more established are these preferences and the harder it will be to overcome them. Even if the new product is superior to all others in the market, customers will be reluctant to try it, because they do not know that it is better for them until they have tried it. If the same price is charged for the new and existing products, the new product will attract very few new customers, because of the high search costs customers face. In this case, the only way that the new product will attract new customers is by charging less than the existing products—that is, undertaking to meet the search costs incurred by the customers. For this reason, new products in markets exhibiting these characteristics are typically introduced with free trials.

However, if a new internet application is offered free of charge to consumers, because the costs are recovered from advertising or other sponsored revenues (e.g., donations, tax funding), it is not possible to discount the application cost to encourage switching. The only way that potential customers' search and switching costs can be reduced is by reducing the internet access charge. Hence, zero-rating may be the only viable way of inducing existing consumers to try a new application. Not being able to offer zero-rating thus constitutes an entry barrier to new applications seeking to compete with established ones. Just as in question four, it will be existing applications providers, and not new entrants, who would prefer that zero-rating not be allowed. However, it is important to note that there are two different reasons for coming to this conclusion.

This gives rise to our fifth question for regulators and adjudicators.

Question 5. Do consumers of the zero-rated application and its rivals make payments to applications providers separate from their payments to ISPs?

If the answer to this question is 'no', then the party with the most plausible reason to use a zero-rating strategy may be a new entrant. Preventing zero-rating then may lead to barriers to entry that protect incumbents. If the answer is "yes', then the situation is more complex, and further investigation is warranted.

5. Conclusion

In sum, therefore, the economic analysis reveals that the strategic motivations for using zero-rating are complex, and turn on a wide range of contextual factors, across all parts of the internet ecosystem. The five questions posed here tease out some factors to inform all ecosystem participants, but especially policy-makers and regulators.

The questions both draw upon, and highlight the fact that, the internet ecosystem is as complex, dynamic and adaptive system that defies simplistic definitions, and cannot easily be analysed or governed using simple frameworks developed for an environment with simple, linear relationships where cash flows closely followed product flows. To the extent that the ecosystem closely intertwines the activities of ISPs and CAPs with end users, it is no longer sufficient for regulators and competition authorities to consider zero-rating as solely an activity governed by the strategic intentions of ISPs alone. The questions posed in this chapter are not intended to substitute for detailed case-by-case analysis based upon economic principles of welfare maximisation, but rather stand as a complement to the frameworks currently being used in regulatory and judicial processes to assess likely harms and benefits.

There is much still to learn about competition and regulation of this complex ecosystem, but the questions here go some way to ensuring that scarce resources are used to investigate the cases most likely to be welfare harming.

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