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**Article**

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# Beyond 'zero sum': the case for context in regulating zero rating in the global South

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**Abstract:** Critics contend that zero rating (ZR) imperils network neutrality, while proponents defend ZR as an internet on-ramp for billions. Prevailing voices have thus reduced zero rating to a zero sum game. As a corrective, this paper argues that instead of siloing the issues of network neutrality and the digital divide, and their relationship to zero rating, these sets of concerns must be drawn into a nuanced debate with one another. To advance this approach, I analyse the multiple forms of ZR offered in four wireless markets – Brazil, Colombia, Mexico and South Africa – across two dimensions: political-economic and developmental. I make the resulting case that through granular contextualisation, we should recognise the complexity of factors related to network neutrality and digital inclusion in order to arrive at an informed appraisal of this pervasive, and divisive, form of mobile internet access.

**Keywords:** zero-rating, Network neutrality, Digital inclusion, Regulation

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## INTRODUCTION

The contestation of network neutrality<sup>1</sup> in the United States was arguably the predominant communications policy debate over the last decade (Bauer and Obar, 2014). This otherwise

arcane aspect of telecoms policy became the locus of concerns about limiting freedom of expression online, the stifling of digital innovation and exacerbating market concentration. Although major policy developments on this issue occurred concurrently in several countries of the global South (Belli & De Filippi, 2016), it is the practice of 'zero rating' mobile apps – exempting content and services from data charges (de Miera, 2016) – that has wrested academic and media attention away from the US case. There are shrill arguments on either side. Those who oppose zero rating (henceforth ZR) frame it as a “pernicious” threat to network neutrality and the multiple social goods that it protects (notably innovation and expression) (Crawford, 2015; Malcolm, 2014). Proponents defend zero rating as an internet on-ramp for the billions offline (Katz & Callorda, 2015; West, 2015). Prevailing voices have thus reduced ZR to a zero sum game; one torn between the apparently incommensurate goals of facilitating access, and preserving a neutral network.

Moreover, with some notable exceptions (A4AI, 2016; Mozilla, 2017; Marsden, 2016), judgements on ZR have tended towards broader theoretical strokes rather than granular empirical analysis. This tendency has become pronounced because Facebook's one-size-fits-all Free Basics programme – offered in one basic format in 63 countries worldwide (Internet.org, 2017) - has dominated consideration of the issue and shaped the contours of the debate accordingly. In fact, much of the ZR offered in the global South is tailored by individual carriers and varies considerably<sup>2</sup>. There is no universal prescription for zero rating, so analyses should be rigorously contextualised.

Accordingly, this paper examines the mesh of competing concerns around ZR to identify the complex interrelationship between them. I contend that through a pragmatic and contextual approach, we can move beyond absolutist judgements and better defend the social goods sought both by advocates of net neutrality (Crawford, 2015; Van Schewick 2012) and digital inclusion (West 2015).

We can observe these polarised tendencies in regulatory decisions. Market absolutists such as the head of the US' FCC, Ajit Pai, claim that his *laissez-faire* approach to ZR benefit “those with low incomes” and encourage “a competitive marketplace” (Brodkin, 2017). Preserving network neutrality in this judgement scarcely registers as a concern. Conversely, the veto on zero rating implemented by India's TRAI in 2016 was based primarily on the perceived threat to an “open and non-discriminatory” network (TRAI, 2016). This ban negates the possible benefits of ZR to millions of economically disadvantaged Indian citizens. The prospect of a regulatory ripple effect from two of the world's largest telecoms markets is genuine. It is essential therefore to develop empirical analyses that can contribute to informed and balanced ZR regulation; or in other words, which effectively reconciles the rights of ZR users with no other means to access the internet, and the need to safeguard innovation, competition and free expression.

This article analyses the multiple forms of zero rating offered in four wireless markets – Brazil, Colombia, Mexico and South Africa - across two dimensions: political-economic and developmental. By using these contextual frames, I identify the factors that exacerbate or mitigate ZR's impacts on net neutrality and access. By weighing up these factors, I contend that we can better identify circumstances in which ZR could be sanctioned as a short-term means to boost mobile internet access. Conversely, in other contexts, ZR constitutes an intolerable infringement upon network neutrality, local innovation and freedom of expression.

Wireless markets in the global South are a dynamic object of study, with market offerings and regulatory decisions often in flux. Zero rating represents this dynamism in miniature. The case studies presented here capture particular modes of enabling mobile internet access; some of

which may be obsolete within months, while others may become consolidated as dominant business practices. Only by tracking this 'moving target', however, and by applying the dominant presumptions about ZR to actual market conditions, will we be able to make informed judgements and meaningful policy interventions.

## STRUCTURE AND CONTRIBUTIONS OF THIS ARTICLE

This paper offers three principal contributions to the existing literature, and proceeds in three stages. In the first section, in addition to proposing a working definition, I identify the main arguments regarding ZR's impact on network neutrality and mobile internet access. I present my first contribution here: a typology of the six forms of zero rating most prevalent in these four wireless markets. This provides the set of definitions that I use in my analysis, and adds two significant sub-categories absent from existing typologies (Carrillo, 2016; Belli, 2017).

In the second section I present a fine-grained analysis of all mobile internet offerings in the four countries using this typology. This demonstrates the prevalence of zero rated mobile internet services therein.

The central contribution of this article features in the last section. Here I examine these four wireless markets across two analytical frames:

- **political-economic**, where I scrutinise the wireless market in terms of concentration, market-share and ownership structure. Various traditions within the political economy of communication focus on these criteria in order to analyse market strength, including the institutional political economy tradition (as described in Mosco, 2008) and critical Marxist approaches (Fuchs, 2015). I, however, follow most closely the monopoly capital school developed prominently by McChesney (2000).
- **developmental**, in which I assess the affordability and penetration of the mobile internet, the level of local innovation, as well as state-led initiatives to boost internet access. In this frame I use development indicators as commonly applied within ICT4D research (e.g., Levendis & Lee, 2013)

Thereafter I assess how these insights might be applied to the challenge of crafting effective public policy around ZR in the global South.

## METHODOLOGY

These countries have been purposefully selected in order to generate a rich array of findings from a limited number of cases. Three continents are represented, thus recreating some of the wide geographical range encompassed by the global South. There is also a diversity of scenarios with regard to key variables such as affordability of mobile services and the presence of programmes like Facebook Inc.'s *Free Basics*. Finally, the four countries demonstrate different approaches to legislating network neutrality and offer the opportunity to examine the relationship between forms of network neutrality legislation and the extent to which it is compromised by ZR.

In terms of analytically useful commonalities, all four countries are classified as large, but less mature, telecoms markets (Groene, Navelekar, & Coakley, 2017). Accordingly, they could represent bellwethers for the rest of the global South in terms of market and regulatory trends. Finally, all four countries selected are ones in which material could be accessed in languages

spoken by this researcher.

To delimit the study, only those carriers with +10% of national market share were included. All data regarding mobile data offerings was collected from the carriers' websites and was accurate as of August 2017. Where offerings varied by region, data was collected for the largest metropolitan area - e.g. São Paulo for Brazil.

## ZERO RATING, NETWORK NEUTRALITY AND MOBILE INTERNET ACCESS

Zero rating refers to the practice of mobile web content being offered to consumers by mobile ISPs (MISPs) without counting against their data allowance. Indeed, it is essential to note that ZR is a product of the artificial scarcity implied by the imposition of data caps, without which ZR would hold no attraction for existing mobile internet users. ZR can therefore represent a cost saving to users as data plans typically limit the volume a subscriber may use per billing period. MISPs and content platforms, meanwhile, offer the service based on the calculation that longer-term revenue will outweigh short term costs through increased take-up of mobile internet services. ZR has become increasingly ubiquitous in wireless markets in the global South where cost presents a greater obstacle to mobile internet access than in the global North (ITU, 2015).

Before proceeding further, it is important to settle on a precise definition of ZR. Rossini and Moore offer a useful starting point by classifying zero rating as a matter of *billing* management by MISPs that discriminates between web content through *price*, rather than technical *network* management (2015, p.1). In turn, Marsden highlights the essential feature of *positive* discrimination of web content that characterises zero rating, as opposed to the *negative* discrimination implied by throttling or blocking (2016, p.7). By combining these, I propose the definition of zero rating as *the practice of positive discrimination of web content by mobile ISPs enabled by billing management practices*. Using this definition rather than a strict focus on 'free' services is important because it captures the practice of differential pricing that is commonly used to sell app-specific bundles and that might otherwise escape analysis.

### NETWORK NEUTRALITY

The concept of network neutrality features in discussions of zero rating because the former is compromised by the latter. Net neutrality refers to the normative goal that all data should move across the internet without being subject to discrimination based on origin or type (Wu, 2003). Academics and activists have interpreted net neutrality as a means to protect innovation and competition on the internet (Van Schewick, 2010), as well as users' speech and information access rights (Nunziato, 2009). Regulatory actions have also been guided by such concerns, for example the BEREC 'Guidelines on the Implementation by National Regulators of European Network Neutrality Rules' (BEREC, 2016). By facilitating positive discrimination of web content, ZR constitutes a violation of network neutrality. By extension, ZR may also impede innovation, competition and free speech.

Zero rating necessarily favours access to certain web platforms at the expense of others. MISPs therefore assume a gatekeeper role "that pick winners and losers online" and "undermines the vision of an open Internet where all applications have an equal chance of reaching audiences" (Van Schewick 2016, p.4). This is exacerbated by the fact that most ZR features globally dominant platforms (Viezens & Callorda, 2016). Indeed, findings from the Zero Rating Map

show that in each of the 100 mapped countries, at least one Facebook-owned app is zero rated. Meanwhile, the lower user bases and shallower pockets of smaller content providers, start-ups and non-commercial services means they are often left on the sidelines, which can distort competition and impede innovation. These effects may also manifest themselves amongst MISPs if zero rated offers serve to entrench the market power of dominant players.

At the same time as market distortions might be observed through infringement of net neutrality, the freedom of expression of users may also be diminished. Zero rating favours certain speech and information resources at the expense of others, meaning that the internet's potential as a democratic space of open communication - already threatened by state surveillance, corporate control over user data and widespread disinformation - is further imperilled. It is also possible that users become siloed within a 'walled garden' of content. Finally, it is important to note that the quest to collect user data often drives ZR schemes. This has been well-documented in the case of Free Basics (LaFrance, 2016), and is also evident in jurisdictions such as Brazil, where the offer of zero rated applications becomes a means to circumvent internet regulation that prevents MISPs from monitoring the content of user communications (Presidencia da Republica, 2016)

There are, of course, counter-arguments. In the case of the wireless sector, if the market for MISPs is already competitive, then the presence of zero rating may not unduly distort it (Saenz, 2016; Galpaya, 2017). Moreover, if a smaller, struggling incumbent, or new entrant, can use zero rated offers to entice more subscribers, this may result in greater competition. Another claim is that because MISPs benefit from users accessing an ecosystem of applications, the carriers themselves will act to prevent zero rating from become anti-competitive at the application layer out of economic self-interest (Eisenach, 2015). The argument follows that this would therefore apply a natural brake to any tendency towards a non-neutral network.

In terms of user communication rights, one must ultimately be cognisant of the possibility that access to some applications may be better than none; a point that segues into discussion of the relationship between zero rating and mobile internet access.

## **MOBILE INTERNET ACCESS**

The goal of increasing rates of mobile internet access is often invoked alongside net neutrality in discussions of ZR. This is because of the obvious potential that a cost-free form of mobile internet represents for boosting adoption. Increasing levels of mobile internet access amongst those estimated four billion people for whom the cost is prohibitive (ITU, 2015) is a goal that animates many NGOs, technology corporations and governments. Alongside the presumed commercial benefits for those providing the connectivity (the opacity of the economic arrangements negates the possibility of knowing for certain), the goal of increasing mobile internet access is justified on the basis that it will improve health, education, economic productivity and even democracy.

Although some research suggests that ZR is used in conjunction with a data cap (that permits open access to any web content within a pre-agreed data allowance) as a cost-saving measure (A4AI, 2016; Mozilla, 2017), for many users, zero rated offers may constitute their only access to the internet. Given the importance of messaging apps like WhatsApp for everyday communication in much of the global South (Galpaya, 2017) the significance of free access should not be understated.

One oft-repeated argument by proponents of zero rating (most notably the platforms and carriers) is that these services constitute an internet 'on ramp' for non-users. Facebook's own

research claims that 50% of Free Basics users go on to become full mobile internet subscribers (2015). Independent research offers some different perspectives. Surveys of 1000 users conducted by the Alliance for Affordable Internet (A4AI) in each of Colombia, Peru, Ghana, Nigeria, Kenya, India, Bangladesh, and the Philippines showed that only 12% of respondents had not experienced the internet prior to using a zero rated service (A4AI, 2016). Similar research conducted in seven developing countries on behalf of the Mozilla Foundation also discounted the 'on ramp' theory (2017).

Other arguments that connect ZR to an increase in the provision of affordable access focus on the possibility that zero rating can boost innovation for impoverished users as they join the network and edge providers offer specialist services corresponding to their needs (Sylvain, 2015). Furthermore, some researchers – as well as industry actors (Brito, 2015) – note the possibility that financial arrangements between content providers and MISPs could be struck, funnelling revenue towards infrastructure build-out (Berglind, 2016). This would in turn facilitate increased rates of internet access. However, the opacity of these agreements negates knowing this for certain. As a final counterpoint, some observers fret that ZR might permit governments a 'free pass' on infrastructure investment (Rossini & Moore, 2015, p. 12).

Having concluded this brief survey, we should now classify the forms of zero rating available to consumers in the global South. The following typology is based on analysis of the four wireless markets featured in this research, as well as the wider literature.

Table 1: Typology of forms of zero – and Near-o – rated data offers in the global South

MISP-driven	Model	Pre/Post-Pay <sup>3</sup>	Description	Example
	<i>Apps plus cap</i>	Post	Unlimited access to suite of apps with data cap for complete internet	Tigo's 'Combo' plan (Colombia)
	<i>Add-On</i>	Either	Single app made available as optional add-on, with data charge waived	TIM's 'Torcedor' (Brazil)
	<i>Triple-lock bundle</i>	Pre	Time-limited data cap for a suite of apps	Movistar's 'Recarga' (Mexico)
Content-driven	<i>Platform ZR</i>	Either	Platform-driven walled garden	Free Basics/ Internet.org
	<i>Earned data</i>	Either	Data earned in exchange for content consumption	Vivo Ads (Brazil)
	<i>Non-commercial</i>	Either	Users provided free access to non-commercial content. Not exclusive to carrier	Wikizero <sup>4</sup>

Table 1 shows six forms of zero rated mobile internet services. They are grouped into two broad brackets: MISP-driven and content-driven. As mentioned above, I propose a broader definition of ZR that includes a bundled approach to selling apps and web services that I call *Near-o Rating*. Although the service is not free, it corresponds to a form of positive discrimination

premised on pricing. It also favours access to a select few globally dominant content and messaging platforms.

This practice is exemplified by the widely offered pre-pay *Triple-lock bundles* in which the limitations are trifold: temporal, volume-based and content-specific. An archetype is Movistar’s *Recarga* package in Mexico in which a data-capped bundle of access to WhatsApp, Facebook and Twitter is offered on a sliding scale from 24 hours to one month.

The most common form of zero rating in post-pay consists of unlimited access to a suite of web applications – typically Facebook, WhatsApp and Twitter – as part of a data contract that includes capped access to the wider internet. The Colombian carrier Tigo offers an archetype with their *Combo* plan that includes a sliding scale of monthly data allowances, from 800MB to 6GB, alongside unlimited access to six apps.

While both of these models represent clear forms of discrimination, it becomes more explicit when a) there is no additional data cap for the open internet, or b) when the zero rated content continues to be available after any accompanying data cap is reached. Both of these variants possess the potential to lock users into a ‘walled garden’ of content.

‘Earned data’ meanwhile refers to promotions in which users are rewarded with a data allowance in exchange for consumption of a certain kind of web content, likely an advertisement. An example of this type of zero rating exists in Brazil in the form of a partnership between the carrier Vivo and Procter & Gamble (Telecom Paper, 2016).

There are two other principle forms of content-driven ZR. Facebook’s ‘Internet.org’ project (re-branded ‘Free Basics’ in 2015) launched in 2013 (Internet.org, 2017) is the most conspicuous example of ‘platform ZR’ (Belli, 2016). It partners with a mobile carrier to offer voice-only subscribers access to a suite of pared down web applications and services – including Facebook itself – at no cost, but with no access to the wider internet. According to Facebook’s CEO, Mark Zuckerberg, it is an altruistically-driven plan to “connect every village...and improve the world for all of us” (Bhatia, 2016). Its critics, meanwhile, interpret it as a ploy to lock the four billion unconnected people in the global South into a corporate-faux-Internet (Levy, 2015).

Finally, there is also a non-commercial model of ZR. For example, the Wikimedia Foundation operated Wikizero 2011-2018, establishing non-exclusive partnerships with mobile carriers in countries where cost constituted an acute obstacle to access in order to provide free access to Wikipedia content (Wikimedia Foundation, 2017). Another state-led example is the Brazilian *800 Saude* app that provided healthcare information (Governo do Brasil, 2017). When non-commercial models are offered non-exclusively, the benefits for access to knowledge are evident, while the infringement on net neutrality in terms of competition, innovation and expression should only concern absolutist defenders of the principle (Malcolm, 2014).

## PREVALENCE OF ZR IN THE COUNTRIES UNDER ANALYSIS

Table 2: Extent and form of zero rated mobile internet services



Country	% of post-pay services incl. ZR in each market (% 'apps + cap') <sup>5</sup>	% of pre-pay services incl. ZR in each market (% 'triple lock')	Availability of Free Basics
Brazil	33% (100%)	76% (100%)	N
Colombia	100% (100%)	100% (100%)	Y
Mexico	100% (100%)	72% (100%)	Y
South Africa	10% (0%)	33% (0%)	Y
Sources: Websites of all MISPs with more than 10% wireless market share. Data collected July 2017. See <a href="#">annex</a> for full details.			

In examining these data in [Table 2](#), we see that the 'apps plus cap' model in post-pay, and the 'triple lock' model in the pre-pay segment represent the dominant forms of zero rating internet services. In terms of the markets as a whole, in Mexico and Colombia, ZR has become integral to the preferred business models of the major carriers. In Brazil there is a significant difference in the extent of zero rated services in the pre and post-pay segments, while in South Africa, zero rating constitutes a minimal share of the market mix.

In order to gain further insight from these data, it must be properly contextualised. Accordingly, I will now examine the data through two frames: political-economic and developmental.

## TWO CONTEXTUAL FRAMES FOR UNDERSTANDING THE RELATIONSHIP BETWEEN ZR, NETWORK NEUTRALITY AND MOBILE INTERNET ACCESS

### THE POLITICAL-ECONOMIC FRAME

The level of wireless concentration, the market positions of the carriers offering ZR, ownership of zero rated content services as well as the market strength of the zero rated service all have a significant bearing on the degree to which network neutrality is compromised.

Table 3: Wireless market characteristics

Country	Number of MISPs w/+10% market share	Market concentration: HHI & Score <sup>1</sup>	Wireless market share (mobile Internet subs)
Brazil	4	2,457 (Unconcentrated)	Vivo 31%; TIM 25%; Claro 25%; Oi 17% <sup>2</sup>
Colombia	3	3,737 (Moderately concentrated)	Claro 49% (53%); Movistar 23% (30%); Tigo 18% (12%) <sup>3</sup>

Country	Number of MISPs w/+10% market share	Market concentration: HHI 6 Score <sup>1</sup>	Wireless market share (mobile Internet subs)
Mexico	3	5,152 (Highly concentrated)	Telcel 65% (70%); Movistar 23% (15%); AT&T 11% (14%) <sup>4</sup>
South Africa	3	3,205 (Moderately concentrated)	Vodacom 35%; MTN 35%; Cell C 17% <sup>5</sup>
Sources: <sup>1</sup> Economist Intelligence Unit, 2017; <sup>2</sup> Anatel, 2017; <sup>3</sup> MinTIC, 2017; <sup>4</sup> ITF, 2017; <sup>5</sup> Business Tech, 2017.			

When we think about zero rating and its impact on network neutrality, the market strength of the participating MISP is a key criterion. The case of Mexico is emblematic in this respect. Its wireless market is highly concentrated, with one player – América Móvil's subsidiary, Telcel – accounting for 70% of all mobile internet subscriptions (ITF, 2017). The fact that all of Telcel's post-pay, and one third of its pre-pay, data plans feature zero rated content means that the impact on competition is more acute. This is also true for the moderately concentrated market of Colombia where the market leader, Claro (also owned by América Móvil), offers zero rated services. It is probable that the offer of ZR will further exacerbate concentration in these wireless markets as the zero rated offers attract even more subscribers to the dominant MISPs.

These effects can also be registered in the content market. Research by Van Schewick in the United States shows that users will tend to favour zero rating over content that counts towards their data caps (2016). This distortion in the online environment is exacerbated when we consider that - in common with all of the zero rated content presented in Table 4 - all of Telcel's zero rated content features the globally dominant platforms in terms of active users <sup>7</sup>: social network Facebook; micro-blogging service Twitter; and messaging app WhatsApp (Statista, 2017). The phenomenon of network effects is accelerated when simple notification services (SNS) and messaging apps are zero rated which may hasten the onset of user 'lock-in' (Palfrey & Gasser, 2012), which would in turn further distort market competition.

Table 4: Zero rated content characteristics

Country	ZR that includes MISP-owned content (%)	ZR that includes global content platform (%)	Exclusivity between global content and MISP	Local content incl. in ZR offers
Brazil	31%	84%	N	N
Colombia	20%	100%	N	N
Mexico	33%	100%	N	N
South Africa	0%	100%	Y	Y

Moreover, if a carrier zero rates its own service, then we see a pernicious form of vertical integration in which one entity not only owns the pipes, platform and content, but can effectively lock users into this proprietary funnel through price discrimination. It should be noted that the phenomenon of 'lock-in' (Palfrey & Gasser, 2012) can occur irrespective of the use of ZR, and is widely considered to have a negative impact on innovation and competition within

the market in question. We see this in the case of Telcel as it exacerbates its market power by zero rating its *Claro Video* service on 2/3 of its post-pay plans. Indeed, in Mexico, Colombia and Brazil 8, 20-33% of all zero rated services featured carrier-owned content and services. In all cases bar one (Tigo in Colombia), these were offered by the national subsidiary of one of four global operator groups: Telefónica, America Móvil, Telecom Italia and AT&T. This is significant because these are multinational corporations - with the former two in a dominant position in Latin America – meaning that when they zero rate their own content platforms in one market, it may serve to consolidate their power regionally.

The infringement of network neutrality by ZR could be justified as pro-competitive if it was offered by an MISP with the smallest market share; it might serve to attract more users, increase its share and thus make the market more competitive (Goodman, 2016). This would be especially true of markets that are defined as moderately or highly concentrated, such as Colombia and Mexico. While AT&T in Mexico (9%), and Tigo in Colombia (17%) are the market laggards and offer ZR in all of their plans, they do so in the context of ubiquitous ZR. As such, the pro-competitive impact is muted.

South Africa offers the only case where the smallest player – Cell C with 14% market share - offers ZR (Free Basics) in a moderately concentrated market where the dominant incumbents do not. This example also highlights the only instance of exclusivity between a zero rated global content platform and an MISP in this study. According to Marsden's (2016) analysis, exclusivity in ZR arrangements should be *ex ante* prohibited. This arrangement can in theory create a more concentrated market than the non-exclusive alternative because it would draw even more users onto the favoured network in order to benefit from the zero rated services. The market position of Cell C is such that in this case, that is only a minor concern.

Brazil, unique amongst these four cases, can boast of a wireless market comprised of four large MISPs closely matched in market share. The provision of ZR by these carriers also seems to follow a pro-competitive model in that the two players grappling for second place, TIM and Claro, are more aggressive in their use of zero rated inducements than the market leader, Vivo 9. The outlier, however, is the fourth placed Oi SA that comprises 17% of the market and offers no ZR.

Although the infringement of network neutrality through the zero rating of locally developed apps and content could encourage local technological development, the data collected for this study suggests that this is a distant prospect. The only examples are the apps included in the Free Basics suite offered by Cell C in South Africa. This includes the youth employment accelerator Harambee, and the literacy app Fundza (Cell C, 2017). In this case, it should be noted that Facebook serves as the arbiter of which apps will be granted the privilege of admission, appointing themselves *de facto* gatekeepers of South Africa's app ecosystem and discriminating against those applications that are not included in the Free Basics suite.

In sum, by applying this political economy lens to ZR and the markets in which it is offered, we can identify various instances of *red lines*, where ZR not only infringes network neutrality, but does so in a way that has a significantly detrimental impact on competition and innovation in the wireless and/or content market:

- Any offer of ZR in a highly concentrated market (except by the carrier with lowest market share) <sup>10</sup>
- Any exclusive offer of ZR (except by the carrier with lowest market share)
- Any offer of ZR by a carrier majority-owned by a global operator group (unless lowest market share)

- Any carrier zero rating their own content/platform

We can also identify *amber zones* in which ZR's benefits to innovation and competition could outweigh the negative impact of its infringement of net neutrality:

- The ZR of locally developed/public interest apps and services in a non-exclusive form
- The offer of ZR by a market laggard/newcomer/struggling incumbent

## THE DEVELOPMENTAL FRAME

The best way to understand the impact of zero rating on rates of mobile internet access is by using a developmental frame. This is because low levels of economic development, limited telecoms infrastructure and high access costs collectively create conditions whereby zero rated access to specific applications could be justified as a stopgap measure in the absence of widely available and affordable mobile internet access.

The offer of zero rated services is sometimes criticised on the basis that it allows governments to evade responsibility for improving mobile internet access for their citizens (Rossini & Moore 2015, p. 12). The enthusiasm with which many governments have welcomed the arrival of Facebook's Free Basics perhaps validates this perspective. A market solution of zero rated internet is ultimately a profit-oriented scheme subject to corporate exigencies, a fact that explains the disquiet of many observers. Although community networks offer great promise to address deficiencies in both private and public provision of access (Baca, Belli, Huerta, & Velasco, 2018), their relatively limited scale means it is important to identify the extent of government programmes to reduce access costs and increase national penetration of mobile broadband. This also needs to be understood in the context of the level of national ICT development and the extent to which a significant deficit needs to be bridged. The national capacity for innovation, meanwhile, is a relevant metric to assess how ZR might stymie the local development of web apps and services <sup>11</sup>. All this data can be reviewed in [Table 5](#).

Table 5: Infrastructure and innovation

Country	ICT development index (/175 country ranking) <sup>1</sup>	State policy to promote free/low cost internet access (/10 score) <sup>2</sup>	Capacity for innovation (/139 country ranking) <sup>3</sup>
Brazil	63	8	80
Colombia	83	9	93
Mexico	92	7	66
South Africa	88	6	32
Sources: <sup>1</sup> ITU, 2016; <sup>2</sup> A4AI, 2017; <sup>3</sup> WEF, 2016			

The other major sub-index to consider is affordability and access. Although the provision of ZR is always offered by content providers with the goal of boosting market share and access to valuable user data, it is often presented by its boosters as a means to overcome socio-economic obstacles to mobile internet access, either by maximising the utility of data-capped open internet access, or providing some app-specific connectivity to those who otherwise have none (Layton & Calderwood, 2015; West, 2015). Intuitively, the provision of a free service should represent a boon to the poorest segments of society. The conundrum to consider is the extent to which the benefits of ZR to the poorest outweigh the potentially negative impact on network

neutrality and its associated social goods. As such, Table 6 presents several key indicators that help to gauge the affordability of mobile internet access, as well as the take-up of those services.

In terms of measuring affordability, A4AI offers a new benchmark: that 1GB of data should not exceed 2% of a user's monthly income ("1 for 2"). A4AI argue that this is a more substantive measure than the 500MB for 5% threshold defined by the UN Broadband Commission (2017). Another useful metric for gauging cost as impediment to access is the proportion of mobile subscribers that use a prepaid plan. This form of mobile access offers users the highest level of cost-control and is therefore often adopted by those with the lowest economic means. Looking at the respective indices of mobile subscriptions and mobile internet subscriptions, meanwhile, serves double duty as a measure both of cost and infrastructure; a significant disparity between the two forms of penetration suggests a barrier of cost and/or a lack of broadband availability. The final metric listed in Table 6 is useful to understand the intensity of the negative impact of ZR on network neutrality: a high proportion of internet use over WiFi means that users are accessing the open, full internet, and are not limited to the walled-garden provisions of application-specific ZR <sup>12</sup>.

Table 6: Affordability and access

Country	Price of 1GB mobile prepaid plan as % of monthly income <sup>1</sup>	Mobile subs/mobile broadband subs (% penetration) <sup>2</sup>	Mobile subs prepaid (%)	% time mobile internet users connected to WiFi (/95 ranking) <sup>7</sup>
Brazil	1.97	119/73	66 <sup>3</sup>	12 <sup>th</sup>
Colombia	1.45	105/47	79 <sup>4</sup>	36 <sup>th</sup>
Mexico	2.03	81/59	84 <sup>5</sup>	28 <sup>th</sup>
South Africa	2.48	160/40	84 <sup>□</sup>	71 <sup>st</sup>
Sources: <sup>1</sup> A4AI, 2017; <sup>2</sup> GSMA Intelligence, 2015; <sup>3</sup> Teleco, 2017; <sup>4</sup> MinTIC, 2017; <sup>5</sup> IFT, 2017; <sup>□</sup> ICASA, 2016; <sup>7</sup> Open Signal, 2016				

Through combining these measures we might illuminate the extent to which ZR could be justified as an expedient for facilitating higher levels of mobile internet access <sup>13</sup>. In the case of Brazil, for instance, it boasts the highest level of ICT development of the four countries according to a cluster of indicators compiled by the ITU. It also scores highly in the A4AI's aggregated metric for measuring the quality of the state's efforts to increase mobile internet access. In terms of affordability, the data in Table 6 shows that Brazil almost exactly meets the '1 for 2' threshold and demonstrates robust levels of penetration at 119% for mobile and 73% for mobile broadband subscriptions. With regards to the forms of access - at 66%, the level of prepaid subscriptions may be high compared to wireless markets in the global North, but it is the lowest of the four countries examined here. Relatively speaking, the level of WiFi use is very high.

Taken together, these indicators suggest that there is no compelling justification for ZR as a means to boost access in the case of Brazil: at least in urban areas where 86% of Brazil's population resides (World Bank, 2017), mobile internet is relatively widely diffused and affordable, ICT infrastructure is robust, and the state is a willing partner in boosting levels of access. Moreover, the high levels of WiFi connection imply that many users are able to access

the open internet, even if they also contract ZR services.

There is of course an alternate interpretation that focuses on the challenge of connecting the 27%, or 56 million Brazilians, who do not access mobile internet. Data compiled in 2015 by the Brazilian Internet Steering Committee showed that 90% of those Brazilians who had never used the internet were in the lowest social classes (Derechos Digitales 2017, p. 56). We can infer that cost is likely a significant impediment to access for these citizens (exacerbating other systemic obstacles such as (digital) illiteracy and a lack of locally relevant content and services), one that ZR could help to overcome. The fact that the Brazilian state is judged to be pro-active in addressing access issues, however, could alleviate concerns that ZR would permit it to abdicate its responsibilities.

South Africa demonstrates a more straightforward case where ZR could be justified as a means to generate access. It does not meet the '1 for 2' threshold, there is a high penetration of mobile subscriptions – many of which are prepaid - accompanied by low levels of mobile internet subscriptions and WiFi access. The country also features in the bottom half of the ICT development index and receives a middling grade for state efforts to boost take-up of mobile internet. The South African government did launch a digital inclusion programme, *South Africa Connect*, in 2013 with the goal of connecting 90% of the population to the internet by 2020 (South African Government, 2013). A review of this plan reveals it is based on market-led initiatives rather than a state-led infrastructure programme. Such an approach may explain why the South African government was receptive to the arrival of Facebook's Free Basics in 2014.

The only factor in this analysis that might undermine the case in favour of ZR is that South Africa ranks highly for innovation capacity (WEF, 2016). Heavy take-up of ZR might therefore damage this positive aspect of the South African economy. There is indeed evidence of this dynamic in practice as a local messaging service was forced to shut down in 2015 citing competition from WhatsApp as the cause (Steyn, 2016).

Colombia and Mexico present similar scenarios in terms of these development indicators and their relationship with ZR. Colombia receives the highest score for its government's efforts to boost access. This is in recognition of the achievements wrought by Colombia's *Vive Digital* programme that aimed to increase its internet connected population to 27 million in 2018 from 8 million in 2014 (Rossini & Moore, 2015, p. 49). Indeed, in 2016 the Colombian government announced an innovative programme dubbed *Internet Móvil Social para la Gente* which provides subsidised data connections and 4G handsets to citizens registered for government welfare programmes (MinTIC, 2016).

In the context of targeted and adequately funded state efforts to increase mobile internet access, the presence of commercial ZR could complement rather than undermine these programmes; a stopgap that addresses economic and infrastructural barriers while more substantive public policy is implemented. This becomes a more compelling argument given that although Colombia comfortably meets the affordability threshold of 1 for 2, it only figures at the halfway mark of the global ICT development ranking, demonstrates a significant disparity between rates of mobile and mobile broadband connections, as well as a high proportion of prepaid subscriptions.

Finally, Mexico appears lowest in the rankings for ICT development of the four countries here, the penetration rates are the lowest, and the level of prepaid subscriptions the highest alongside South Africa. And although Mexico technically meets the 1 for 2 benchmark, OECD data reveals that for the poorest tier of households, the cost of a mobile subscription represents 6.2% of monthly income (OECD, 2017). This suggests that Mexico faces a significant challenge in

facilitating adequate levels of mobile internet access, one which ZR might partially address. Although the Mexican state received a lower score than Colombia or Brazil for fomenting access – though still above the emerging country average of '6' (A4AI, 2017) – it has embarked on major ICT infrastructure projects such as *Mexico Conectado* and *Red Compartida* (IFT, 2017). This scheme is sufficiently well-developed in terms of existing investments, and ambitious enough in terms of future goals (OECD, 2017), to suggest that in common with Colombia, ZR might serve to complement rather than derail state connectivity programmes.

Overall, it is hard to define hard 'red lines' for ZR by examining access through development indicators. This is because the confluence of factors is more dynamic and complex, especially within the infrastructure and innovation sub index. In the first instance, the diverse states of telecoms infrastructure in the four countries under examination here further complicates the equation. Moreover, it is difficult to interpret whether a country's low score for state connectivity programmes means that ZR should be considered a threat to those nascent efforts, or an essential stopgap to realise the same objectives. Similarly, does a high level of capacity in national technological innovation mean that ZR constitutes a grave threat to the growth potential for the mobile software sector, or does it suggest that this ecosystem is robust enough to withstand the pressure? These are fundamental questions to consider when we wish to evaluate ZR, and can only be substantively addressed through greater contextual analysis than the parameters of this study permit.

A more straightforward case to be made, one grounded in affordability and access, is that a combination of low penetration and high cost mean that there is a compelling argument for ZR addressing an economic barrier for many users. Even on this point, however, we must be aware that the 1GB for 2% of monthly income measure can prove a blunt tool as it is based on average income (A4AI 2017, p. 47). In societies like Brazil and Mexico that meet this affordability threshold, the economic inequality is such that the wealthy few skew the average. Thus for many, the cost of mobile internet will be more onerous, and the economic benefits of ZR potentially more significant.

## CONCLUSION

Zero rated mobile internet services represent a thorny public policy challenge in the global South. On one hand they can overcome cost barriers to realise the valued goal of increasing mobile internet penetration. On the other, the dangers ZR poses to competition and innovation in the wireless and online services markets, as well as the implications of locking users into 'walled gardens' of content, are apparent. The premise of this research is that the challenge of ZR can be better addressed when it is rigorously contextualised; when we weigh the values of both neutrality *and* access on the scale. To that end, I created a typology of models of ZR. This classified the forms in which ZR is sold, and moved beyond a strict focus on 'free data' to demonstrate that 'Near-o Rating' offers should also be considered.

I also identified two contextual frames through which ZR should be examined in order to evaluate the factors that accentuate or diminish its impact on neutrality and access. A political-economic lens guides our focus towards the market power of participating actors, as well as the circumstances in which the infringement of network neutrality can become pro or anti-competitive. Examining indices of technology diffusion, meanwhile, helps to assess whether ZR can address affordability and infrastructural deficits, as well as whether local innovation might be impeded.

Through charting the uneven conceptual terrain on which ZR appears, we can discount the notion that addressing ZR is a zero sum game composed of an 'access *or* neutrality' calculation. Instead, we need to be much more attentive to the multiple interlocking factors that influence how ZR impacts upon both the social goods sought by defenders of network neutrality, as well as the goals of digital inclusion advocates. The precise composition of these factors will vary in every society and wireless market, so the manner in which they are reconciled will depend on national policy priorities. Whether ZR is interpreted as a curse or a boon for local app development, for instance, is a matter for the relevant regulators, advocacy groups and industry associations to decide. Moreover, as previously stated, ZR is a moving target, and although the dominant tendency captured in this research is to zero rate market leaders in each application category, an alternative approach based on zero rating entire classes of applications would require that the negative implications of ZR for innovation and competition would need to be reassessed.

A policy of subsidised data and handsets, as introduced in Colombia, is arguably the ideal way to address limited mobile internet penetration for the most economically disadvantaged. However, in the absence of such progressive public policy, an absolute veto on ZR threatens to make the perfection implied by full internet access for all, an enemy of the good. Any proponent of an absolute ban on ZR should rehearse a speech to an impoverished user in the global South to explain why access to socially essential communication services should remain beyond their means. Ultimately, rather than an on-ramp, we might better conceptualise ZR as a temporary relief road: a makeshift piece of the network that can accommodate mass demand while the proper permanent infrastructure (through both public policy and market provision) is established.

Regarding the limitations of this research, the data on the prevalence of ZR in the four markets examined here represents a snapshot in time, and the available insights are accordingly restricted. Longitudinal studies are needed to assess the impacts of ZR on innovation and competition over time, as well as to understand whether they represent a short-term marketing ploy, or a permanent fixture of these markets. What are also needed are large-scale studies that probe the practices of mobile internet users in the global South. These would help us better understand whether ZR entices non-users online, and the extent to which that introduction shapes later patterns of use; especially whether users migrate beyond zero rated silos.



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## ANNEX

Brazil						
Carrier	Market share*	Operator Group	Plan	Pre/Post ZR		Description
Vivo	30.00%	Telefonica	Vivo Pos	Post	N	4 different voice/data plans from 6-30GB
Vivo		Telefonica	Vivo V	Post	N	4 different voice/data plans from 6-30GB
Vivo		Telefonica	Vivo Controle	Pre/Post	N	5 monthly voice/data plan with data cap 1-3GB. Once cap is reached purchase of new data bundle required.
Vivo		Telefonica	Vivo Internet Redes Sociais	Add on	Y	Triple lock data bundle: one month or one week add-on permitting 400MB or 800MB use of FB, FB Messenger & Twitter. Available with Pre Vivo Turbo and Vivo Controle.
Vivo		Telefonica	Vivo Turbo	Pre	N	4 weekly/monthly voice/data plans with data cap 300MB-1.2GB.
Vivo		Telefonica	Vivo Easy	Pre	N	4 monthly voice/data plans with data cap 1.5-3GB.
TIM	25.00%	Telecom Italia	TIM Pre 1GB	Pre	Y	7 day package including 500MB data cap, voice plus unlt. WhatsApp & music streaming via Deezer
TIM		Telecom Italia	TIM Pre 150	Pre	Y	7 day package including 150MB data cap, voice plus unlt. WhatsApp
TIM		Telecom Italia	TIM Pre Diario	Pre	Y	1 day package including 50MB data cap, voice plus unlt. WhatsApp
TIM		Telecom Italia	TIM Pre 1.5GB	Pre	Y	30 day package including 1GB data cap, voice plus unlt. WhatsApp
TIM		Telecom Italia	TIM Beta	Pre	Y	Monthly & weekly voice/data plan with 10 or 1.5GB cap plus unlt. Music streaming with Deezer
TIM		Telecom Italia	TIM Beta Diario	Pre	N	Daily 100MB
TIM		Telecom Italia	Turbo WhatsApp	Pre	Y	30 day package including 50MB per day for WhatsApp and 50MB data cap for the duration
TIM		Telecom Italia	Infinity Turbo 7	Pre	Y	7 day package including voice, 100MB data cap per day and unlt. WhatsApp
TIM		Telecom Italia	TIM Controle Light Fatura	Pre	N	30 day package including voice and 1GB of Internet
TIM		Telecom Italia	TIM Controle	Pre	Y	30 day package including voice, 2GB of Internet and unlt. WhatsApp and Banca Virtual

TIM		Telecom Italia	TIM Music by Deezer	Add-On	Y	Available with all Pre and Controle plans: weekly unlt'd music streaming for set fee
TIM		Telecom Italia	TIM Black	Post	Y	5 monthly voice/data plans 3-20GB w/TIM Music and Banca Virtual (Brazilian digital magazines at no cost)
TIM		Telecom Italia	TIM Torcedor	Add-On	Y	Available with TIM Pos: free video of your favourite team's goals
TIM		Telecom Italia	TIM Pos Express	Post	Y	2 monthly voice/data plans with 3 or 5GB data cap plus TIM Music and Banca Virtual
TIM		Telecom Italia	TIM Da Vinci	Post	N	Monthly voice/data plan with 50GB data cap
Claro	25.00%	America Movil	Claro Controle	Post	Y	2/3GB monthly voice/data plans w unlt'd WhatsApp, Claro Music and Video
Claro		America Movil	Claro Pos Giga 5/6/7/9/14/25	Post	Y	Includes unlt'd WhatsApp, Claro Musica
Claro		America Movil	Claro PreMix Mega	Pre	Y	250MB monthly data plus WhatsApp & Claro Musica
Claro		America Movil	Pacote WhatsApp	Pre	Y	Multiple daily and monthly voice/data packages w/unlt'd WhatsApp
Claro		America Movil	Claro Pre Mix Super Giga	Pre	Y	1GB monthly data plus unlt'd. WhatsApp & Claro Musica
Oi	18.00%	Oi SA	Pos-Pago	Post	N	4 monthly voice/data plans w/4-20GB data cap
Oi		Oi SA	Controle	Post	N	3 monthly voice/data plans w/1-3.5GB data cap
Oi		Oi SA	Pre	Pre	N	Sliding scale of 8 time-ltd voice/data plans from 10-30 days

Colombia

Carrier	Market share	Operator Group	Plan	Pre/Post	ZR	Description
Claro			Smartphone en prepago	Pre	Y	Triple lock w/Tw, FB, WhatsApp
Claro			Compra tu SIM	Pre	Y	Triple lock w/Tw, FB, WhatsApp
Claro			Reventa Control	Pre	Y	Triple lock w/Tw, FB, WhatsApp
Claro			El Propio Chip	Pre	Y	Triple lock w/Tw, FB, WhatsApp
Claro			Prepago Amigo	Pre	Y	Triple lock w/Tw, FB, WhatsApp
Claro	53.10%	America Movil	Prepago Facil	Pre	Y	Triple lock w/Tw, FB, WhatsApp
Claro			Prepay Data Packets	Pre	Y	Triple lock w/Tw, FB, WhatsApp
Claro			Plan SM/IP Nav	Post	Y	Unltd access to WhatsApp, Twitter, FB
Claro			Plan Navegacion BB	Post	Y	Data cap plus unltd. FB, Twittter, Gtalk, MySpace, Yahoo Messenger, BB Messenger
Claro			Sinlimitenav 1/3/6/10GB	Post	Y	Unltd access to WhatsApp, Twitter, FB
Tigo	17.30%	Millicom International Cellular SA	Cargo basico 1.2 & 2.5 GB	Post	Y	Unltd access to WhatsApp & FB plus either Tigo Go music or Tigo Sports
Tigo	17.30%	Millicom International Cellular SA	Cargo basico 3-5, 4-5, 6.5 GB	Post	Y	Unltd access to WhatsApp, FB & 2 from 13 premium apps
Tigo	17.30%	Millicom International Cellular SA	Paquete prepago (x4)	Pre	Y	1,3,7,30 day packets with data cap and unltd. FB & WhatsApp
Tigo	17.30%	Millicom International Cellular SA	Super Bolsas Tigo (x5)	Pre	Y	30 day data caps. 3 w/unltd WhatsApp; 2 w/unltd. WA & FB
Tigo	17.30%	Millicom International Cellular SA	Prepagada en combo	Pre	Y	15 different time-ltd voice/data packets with unltd. FB & WhatsApp
Tigo	17.30%	Millicom International Cellular SA	Prepagadados de datos	Pre	Y	15 different time ltd. data packets with unltd FB
Movistar	23%	Telefónica Móviles Colombia S.A.	Plan Innovacion (x5)	Post	Y	8 different data caps w/unltd. Waze, Line, FB, Twitter, WhatsApp unltd (even after data cap is reached)
Movistar	23%	Telefónica Móviles Colombia S.A.	Plan Innovacion (x3)	Post	Y	Waze, Line, FB, Twitter, WhatsApp unltd (even after data cap is reached) PLUS Movistar Musica and/or Movistar Play
Movistar	23%	Telefónica Móviles Colombia S.A.	Internet 1,2,4,8GB	Post	Y	Unltd WhatsApp plus data cap



Carrier	Market share	Operator Group	Plan	Pre/Post ZR		Description
Movistar	23%	Telefónica Móviles Colombia S.A.	Todo En Uno	Pre	Y	7/90/180 days of voice/data plus unld. FB, Twitter & WhatsApp
Mexico						
Carrier	Market share*	Operator Group	Plan	Pre/Post ZR		Description
Telcel	67%	America Movil	Max Sin Limite 2/3/5/6/6.5/7/9/12,000MB	Post	Y	FB, Twitter & WhatsApp, Claro Video unld. 5K MB > +Uber
Telcel		America Movil	Telcel Internet 1/2/3.5/7/10/20	Post	Y	FB, Twitter & WhatsApp, Claro Video unld. 7K MB > +Uber
Telcel		America Movil	Telcel Max	Post	Y	FB, Twitter & WhatsApp
Telcel		America Movil	Amigo Sin Limite	Pre	Y	Sliding scale of triple locks w capped FB & Twitter in Mexico & WhatsApp in North America
Telcel		America Movil	Amigo Por Segundo	Pre	N	Sliding scale of triple locks w capped FB & Twitter in Mexico & WhatsApp in North America
Telcel		America Movil	Amigo Optimo Plus Sin Frontera	Pre	N	Sliding scale of triple locks w capped FB & Twitter in Mexico & WhatsApp in North America
Movistar	24%	Telefonica	Vas a Volar - 1.5/3/4.5/6/9/12/15,000MB	Post	Y	plus sliding scale of 2,3 or 4GB of WhatsApp, Tw & FB
Movistar		Telefonica	Vas a volar	Pre	Y	Sliding scale data packets 2/4/5.5/7/10/15 plus sliding scale of 2,3 or 4GB of WhatsApp, Tw & FB
AT&T Mexico	9%	AT&T	AT&T Con Todo 500MB-8GB	Post	Y	10 data packets: Unltd FB, Twitter & Whatsapp AND 'new SNS' Snapchat, Instagram & Uber
AT&T Mexico		AT&T	AT&T a Tu Manera	Post	Y	9 data packets: Unltd FB, Twitter & Whatsapp AND 'new SNS' Snapchat, Instagram & Uber

Carrier	Market share*	Operator Group	Plan	Pre/Post ZR	Description	
AT&T Mexico		AT&T	Unidos Prepago	Pre	Y	Sliding scale of 10 time-ltd packets. All include capped data for Whatsapp, FB and Twitter AND SC & Instag for 5 most expensive packets
AT&T Mexico		AT&T	AT&T a Tu Manera te damos Mas	Pre	Y	2/3/5/8GB plus unltld FB, Twitter, WhatsApp AND unltld Uber, Snapchat, Instagram
AT&T		AT&T	Recarga Plus	Pre	Y	1GB of Internet plus cap for all above SNS
South Africa						
Carrier	Market share	Operator Group	Plan	Pre/Post ZR		
Vodacom	39.20%	Vodafone	VARIOUS (24)	Pre	N	
Vodacom	39.20%	Vodafone	VARIOUS (26)	Post	N	
Cell C	14%	3C Telecommunications (SA)	LTE Power Plan	Post	N	
Cell C	14%	3C Telecommunications (SA)	Smartdata	Post	N	
Cell C	14%	3C Telecommunications (SA)	Smartdata TopUp	Post	N	
Cell C	14%	3C Telecommunications (SA)	FREE BASICS	Pre & Post	Y	
MTN	33%	MTN Group (SA)	MTN Sky (4)	Post	N	
MTN	33%	MTN Group (SA)	New MTN Sky	Post	N	
MTN	33%	MTN Group (SA)	My MTN Choice +Talk	Post	N	
MTN	33%	MTN Group (SA)	My MTN Choice	Pre & Post	N	
MTN	33%	MTN Group (SA)	My MTN Choice Flexi	Post	N	
MTN	33%	MTN Group (SA)	My MTN Choice+	Post	N	

#### FOOTNOTES

1. Network neutrality refers to the principle that network operators should treat all information packets in an isonomic fashion, and should not discriminate based on sender, receiver, content, device or application. Although it is widely agreed that some traffic management practices are essential, these should not extend to forms of discrimination such as throttling and blocking (negative) or priority access (positive) that produce a commercial/competitive advantage for network operators.

2. See the 'Zero Rating Map' coordinated by Luca Belli for a survey of the global landscape of zero rating <https://public.tableau.com/profile/zeroratingcts#!/vizhome/zeroratinginfo/Painel1>

3. Pre-pay services involve an upfront charge to the user, in exchange for a finite amount voice or data service. When the contracted airtime or data has expired, the user must pay an extra charge in order to be permitted to continue using the service, or wait until the beginning of their next billing period. Post-pay services present users with an invoice at the end of each billing period for a service bundle that often permits the user to exceed the caps on any contracted services on a pro-rata basis.

4. The Wikipedia Foundation announced on 16 February 2018 that the service would be discontinued at the end of 2018.

5. The figures listed in this table do not cumulatively equal 100% for each column, but instead indicate in every row the percentage of plans that include a ZR component for each payment category, in each market.
6. The Herfindahl-Hirschman Index measures concentration by the number of firms operating in a particular industry and their market share.
7. Excluding social networking sites where the majority user base is resident in only one country, e.g., WeChat, QQ and QZone.
8. It should be noted that in the Brazilian case, many common examples of zero rating are in fact illegal according to the regulation of the *Marco Civil da Internet* law, which prohibits positive discrimination of vertically integrated apps (Governo do Brasil, 2017)
9. Vivo claims a 30% market share, and does not offer ZR in any of its plans. TIM claims a 25% market share and 90% of its pre-pay, and 66% of its post-pay plans feature some ZR component. Claro also claims a 25% market share, and all of its pre and post pay plans contain some ZR component. All data recorded from the carrier websites in July 2017.
10. It should be noted that in certain situations, ZR of a market-leading platform or service by a struggling or new MISP could restrict competition at the application layer, even if the wireless market is not adversely affected.
11. It should be noted that more granular data is available to assess more precisely the state of innovation within local app development ecosystems. Within the limitations of this study, however, the national capacity of innovation ranking assessed by the World Economic Forum provides a useful proxy for assessing general national innovation, from which the levels of more specific sectors can be inferred.
12. It should be noted that significant disparities in access to WiFi may exist between urban and rural areas, meaning that a high national average could still obscure a dearth of infrastructure in rural areas and a commensurate dependence on ZR.
13. By ensuring that use of certain communication platforms and information services does not count against data-capped access to the full mobile internet, or by providing some app-specific access to those who have no mobile internet access.