An assessment of FST's proposed remedies on parties with significant market power on the wholesale markets of Market 3A and Market 3b.

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Contents

1. Introduction

As part of its market analysis process, FST published on 29 Novembre 2023 two documents, the first looking at additional market analysis and a second document considering remedies that might be applied to parties designated with SMP in Market 3a and Market 3b.

Ljósleiðarinn has asked for a review of the remedies proposed by the FST and a review of the general approach adopted by FST in its assessment of Markets 3A and 3B to date. To that end, TELAGE has appointed Tony Shortall to conduct an analysis and to give his opinion of FST's proposals.

2. The FST has erred in its assessment of geographic market segmentation (whether recommended by EFTA or not).

The notice on market definition[1] tells us that the 'Relevant geographic markets' are defined as follows: *'The relevant geographic market comprises the area in which the undertakings concerned are involved in the supply and Remand of products or services, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighbouring areas because the conditions of competition are appreciably different in those area'*.

A more recent assessment of the notice reaffirms that assessment. According to the EU Jurisprudence and the recent guidance from the European Commission[2]: T*he relevant geographic market comprises the area in which the conditions of competition are sufficiently homogeneous and which can be distinguished from other areas because the conditions of competition are appreciably different in those areas*[3]. That definition of the geographic market is also codified, inter alia, in Article 9(7) of the EU Merger Regulation.

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[1] COMMISSION NOTICE on the definition of relevant market for the purposes of Community competition law (97/C 372 /03)

[2] See SWD(2021) 199 final COMMISSION STAFF WORKING DOCUMENT EVALUATION of the Commission Notice on the definition of relevant market for the purposes of Community competition law of 9 December 1997

[3] This was confirmed, for instance, in the judgment of 5 October 2020, HeidelbergCement AG and Schwenk Zement KG v Commission, T-380/17, EU:T:2020:471 ('T-380/17, HeidelbergCement and Schwenk Zement v Commission'), paragraph 294. In one of its earlier judgments in Case 27/76, United Brands v Commission, paragraph 11, the CJEU stated: 'The opportunities for competition under Article 86 of the Treaty must be considered having regard to the particular features of the product in question and with reference to a clearly defined geographic area in which it is marketed and where the conditions of competition are sufficiently homogeneous for the effect of the economic power of the undertaking concerned to be able to be evaluated.'

The SMP Guidelines[4] tell us that "*The extent to which the supply of a product or the provision of a service in a given geographical area constitutes a relevant market depends on the existence of competitive constraints on the price-setting behaviour of the service provider(s) concerned. There are two main competitive constraints to consider in assessing the behaviour of undertakings in the market; (i) demand-side; and (ii) supply-side substitution. A third source of competitive constraint on an operator's behaviour — to be considered not at the stage of market definition but when assessing whether a market is effectively competitive within the meaning of Directive 2002/21/EC — is the existence of potential competition.*"

The Guidelines go on to tell us at paragraphs 48, 49 and 50 that:

According to established case-law, the relevant geographic market comprises an area in which the undertakings concerned are involved in the supply and demand of the relevant products or services, in which the conditions of competition are sufficiently homogeneous, and which can be distinguished from neighbouring areas in which the prevailing conditions of competition are significantly different[5]. Areas in which the conditions of competition are heterogeneous do not constitute a uniform market[6].

With regard to the choice of the geographic unit from which an NRA should start its assessment, the Commission has frequently stated[7] that NRAs should ensure that these units: (a) are of an appropriate size, i.e. small enough to avoid significant variations of competitive conditions within each unit but big enough to avoid a resource-intensive and burdensome micro-analysis that could lead to market fragmentation, (b) are able to reflect the network structure of all relevant operators, and (c) have clear and stable boundaries over time.

If regional differences are found, but not considered to be sufficient to warrant different geographic markets or SMP findings, NRAs may pursue geographically differentiated remedies8. The stability of the differentiation — specifically the degree to which the boundary of the competitive area can be clearly identified and remains consistent over time — is the key

[4] Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (Text with EEA relevance) (2018/C 159/01)
[5] United Brands, op. cit., paragraph 44, Michelin, op. cit., paragraph 26, Case 247/86 Alsatel v Novasam EU:C:1988:469, paragraph 15; Tiercé Ladbroke v Commission, op. cit., paragraph 102.
[6] Deutsche Bahn v Commission, op. cit., paragraph 92. Case T-139/98 AAMS v Commission, EU:T:2001:272, paragraph 39.
[7] See, for example, Section 2.5 of the Explanatory Note accompanying the Recommendation 2014/710/EU, SWD(2014)298.
[8] Explanatory Note to the Recommendation 2014/710/EU, SWD(2014)298, page 14. See also CZ/2012/1322.

to distinguishing between a geographical segmentation at market-definition level and remedy segmentation.

The critical elements therefore are first, a consideration of the extent to which the conditions of competition are homogenous i.e. are the prices and products available comparable on the market, second, to the extent that they are not homogeneous is that driven by demand, supply (or potential supply), third, are the different geographic areas of an appropriate size (not too big and not too small), fourth are these geographic areas stable (or are network still being deployed or might a new entrant or technology appear and so on) whereby a preference for variation of remedies would be identified.

Conditions of Competition

The extent to which the supply of a product or the provision of a service in a given geographical area constitutes the relevant market depends on the existence of competitive constraints on the price-setting behaviour of the producer(s) or service provider(s) concerned. There are two main competitive constraints to consider in assessing the behaviour of undertakings on the market, (i) demand-side; and (ii) supply-side substitution. These may be further differentiated depending on the separate product market definition into service competition, deployment competition or infrastructure competition. A third source of competitive constraint on an operator's behaviour exists, namely potential competition.

The difference between potential competition and supply substitution lies in the fact that supply-side substitution responds promptly to a price increase whereas potential entrants may need more time before starting to supply the market. Supply substitution involves no additional significant costs whereas potential entry can occur even with significant sunk costs. The existence of potential competition should thus be examined for the purpose of assessing whether a market is effectively competitive within the meaning of the EECC, that is whether there exist undertakings with SMP.

A relevant geographic market comprises an area in which the undertakings concerned are involved in the supply and demand of the relevant products or services, in which area the conditions of competition are similar or sufficiently homogeneous and can be distinguished from neighbouring areas in which the prevailing conditions of competition are appreciably different.

In practice, broad indicators such as a preliminary analysis of pricing and price differences at national and regional levels as well as an analysis the distribution of market shares between the parties and their competitors provide a starting point of analysis. From a competition law perspective, a retail price analysis is a prerequisite of the market assessment– but while a necessary condition, it is not a sufficient condition because retail price differences can also simply reflect different costs of supply. A further analysis of demand characteristics (importance of national or local preferences, current patterns of purchases of customers, product differentiation/brands, other) in order to establish whether companies in different areas do indeed constitute a real alternative source of supply for consumers.

There is nothing in the report of FST that suggests that there are significant retail price differences in different parts of the Icelandic market. The previous analysis noted that retail copper and fibre based access pricing are equivalent to each other, all suggests that homogenous pricing of access is observable in the Icelandic market.

Chains of substitution in geographic markets.

Just as in product market definition, chains of substitution can exist in geographic market definition. The Notice on Market Definition explains that in certain markets it is possible for two (or more) products (or geographic areas) that are not direct substitutes to be included in the same relevant market due to a sequence of substitute products/geographic areas between them – a chain of substitution. This is the case if substitution takes the form of successive iterations throughout the chain, which justifies the inclusion of each product or geographical area in the market.

The boundaries of the relevant market may be expanded to take into consideration products or geographical areas which, although not directly substitutable, should be included in the market definition because of chain substitutability[9]. Chain substitutability occurs where it can be demonstrated that although products A and C are not directly substitutable, product B is a substitute for both product A and product C and therefore products A and C may be in the same product market since their pricing might be constrained by the substitutability of product B. The same reasoning also applies to defining the geographic market. Given the inherent risk of

[9] See 1997 Notice on Market Definition, paragraphs 57 and 58. For instance, chain substitutability could occur where an undertaking providing services at national level constrains the prices charged by undertakings providing services in separate geographical markets. This may be the case where the prices charged by undertakings providing cable networks in particular areas are constrained by a dominant undertaking operating nationally. See also: Case COMP/M.1628 — TotalFina/Elf, paragraph 188.

unduly widening the scope of the relevant market, findings of chain substitutability should be adequately substantiated[10].

Where prices for previous or current generations of technologies can constrain prices for future generations, it is likely that a chain of substitution exists, which would justify the grouping of all generations of technologies in the same relevant product market. As such price-constraints will normally be observable for different generations of technology, they are generally considered to be in the same market.

Therefore, while the physical networks may not perfectly overlap or indeed Operators A and Operator B may compete directly in the same geographic area, there may be other considerations such as chains of network substitution (where pricing in area A containing operator 1 and 2, influences pricing in area B which contains operator 2 and 3 and area C which contains operators 3 and 4. Though operator 1 and 4 do not co-exist anywhere, the pricing dynamic in area A can determine the outcomes in Area C.

Are the different geographic areas of an appropriate size?

Geographic markets should small enough to avoid significant variations of competitive conditions within each unit but big enough to avoid a resource-intensive and burdensome micro-analysis that could lead to market fragmentation.

The position of dominant entities in markets and the resultant need to control their behaviours cannot be determined simply by the presence of competing networks – pricing differences are key to identifying behaviours constrained by competition – an entrant with a large discount which elicits no response for the dominant entity suggests that either the area is not meaningful or the entrant is not seen as a threat – in practice therefore its behaviour is determined elsewhere and not in the putative regional market.

In all this there is a risk that the fruits of competition in competitive areas will be lost through geographic differentiation of markets. For instance, where the competitive portion of the market, is geographically large, this may determine the outcomes for the whole national market. The regional market where only one network exists may act on the basis of the national market which is determined by the competitive area. In this way, even the customers in a monopoly supply area may enjoy the benefits of competition simply because the network owner operates

[10] Evidence should show clear price interdependence at the extremes of the chain. The degree of substitutability between the relevant products or geographical areas should be sufficiently strong.

on a national basis. Setting geographic markets in such circumstances would break that constraint and possibly lead to worse outcomes for regional consumers. Note also, that a regional infrastructure monopoly does not imply the absence of competition at the service level. In case of open network access, customers still have the possibility to have the choice among different retail operators.

The Stability of the Geographic Units

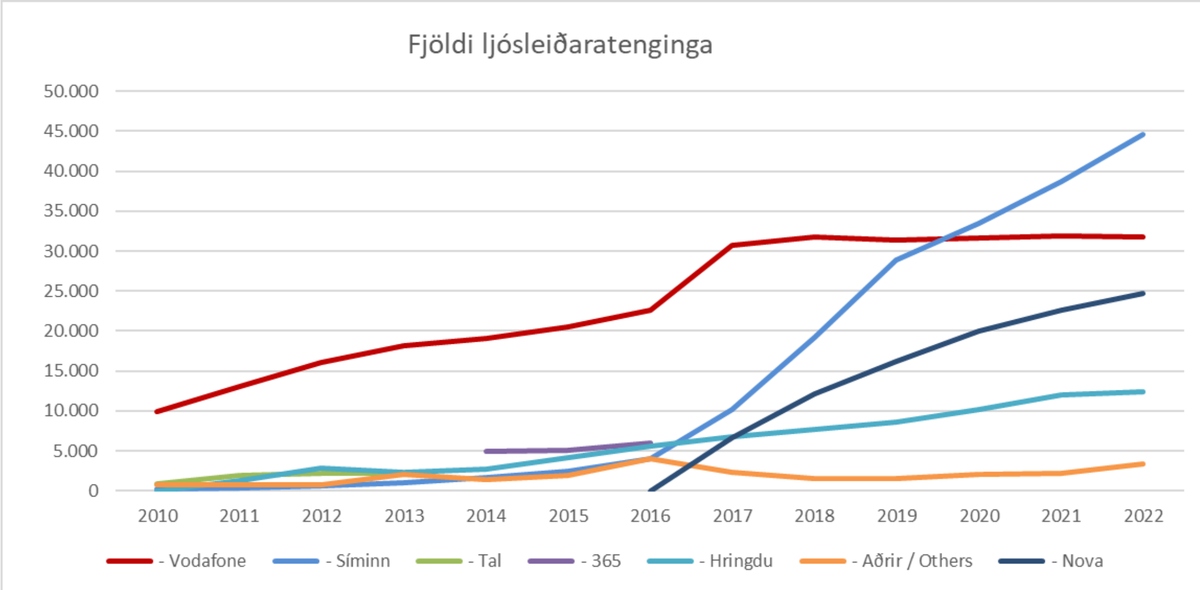
Where the geographic scope of markets is not stable, NRAs are advised to maintain national markets and vary remedies[11] – this is the case for a number of reasons, not least of which is that remedies can be adapted far more quickly to changing market dynamics.

The future geographic scope of FTTH/B networks is not known today because the boundaries of these network builds are not stable over time due to the fact that (a) deployment models and deployment technologies can change and (b) business models such as Infrastructure-focused or Wholesale-Only can change the cost of capital. Therefore, the scope of potential competition cannot be known and there should be degree of caution exercised in pronouncing on the scope of potential competition and more consideration should be given to remedy variations within a national market.

The continued market dynamic and network expansion can be seen in the current consultation by reference to paragraphs 2233, 2238, 2304, 2315, 2321 and 2408 which all point to Mila's continued network expansion or other dynamics allowing other operators to expand their networks.

The lack of stability can be seen throughout the first consultation document, nicely summarised in the following graphic:

[11] Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services. (Text with EEA relevance) (2018/C 159/01)



As noted by BEREC in their review of geographic markets: "If the evidence found points to varying competitive conditions, but the differences between geographic areas are not yet sufficiently stable, a national market could still be defined.[12] Geographical variations in competitive conditions can then be addressed at the remedies stage (e.g. price control obligations might be lifted for some areas, if sufficient safeguards exist)."[13] The larger market share of Ljósleiðarinn in certain areas could be dealt with by relaxing the obligations on Mila in those regions. However, Míla is SMP on a properly defined national market (note that over six year period, Mila's share of a national retail fibre market went up by 450%).

Conclusion.

This analysis all points to a national market on which Mila is dominant. Even if a series of sub-national markets exist within Iceland, then it is too early to judge what the relevant geographic markets are because network is still being built and geographic market boundaries will continue to change. Therefore, a national market on which Mila is dominant should still be identified with variations in remedies by geographic areas if appropriate.

[12] BoR (14) 73, page 35
[13] BoR (18) 213

3. The FST analysis of the application of Article 80 (EECC) is correct.

In terms of specific regulatory obligations laid down in the Code to drive VHCN investments, the momentum to achieve the benefits of this infrastructure-based approach to competition is now laid squarely at the feet of separation remedies. These range from the very specific Article 80 dealing with "Wholesale-only" operators (which have no retail operations and hence, in theory, have no incentive to discriminate against retail competitors), to co-investments made in VHCN where a separate governance structure is likely to emerge in which integrated operators form part of the group of co-investors in network infrastructure. These remedies are prescribed in addition to existing provisions concerning voluntary vertical separation (Article 78) and functional separation (Article 77).

In practice, a Wholesale-only operator can be expected to be essentially exempted from most provisions of the Code, even where that operator is designated to hold Significant Market Power (SMP). On the other hand, a vertically integrated operator that vertically separates its operations has no guarantee that it will be eligible to be treated as a "Wholesale-Only" operator under the terms of Article 80 (Article 59 of the Act No. 70/2022 on Telecommunications is based on Article 80 EECC).

Wholesale-only operators are defined under Article 80 of the EECC and enjoy a large number of regulatory exemptions that provide long term investors with certainty for at least the next 10-15 years. Even where such entrants eventually become economically dominant (or SMP) in their own right, in the provision of wholesale services, they would continue to be exempt from most forms of economic regulation. As noted in the Impact Assessment accompanying the EECC, Case studies from SMART 2015/0002 suggest that "*structural separation/wholesale only models can support the business case for fibre by aggregating demand from several service providers. This strategy has been adopted in particular by regional and municipal investors such as Stokab and Reggefiber to support a fibre business case*."

In the past it has been a prerequisite for services based competition that some form of mandatory access to the incumbent network is available so as to allow the competitors the possibility to use the access network on reasonable conditions. This is not a simple exercise for the regulator because the incumbent has the incentive, and the ability, to engage in anticompetitive behaviours either in the form of price or non-price discrimination. Price discrimination consists in charging excessively high wholesale prices on competitors or in applying predatory prices to its own retail customers, in order to drive new entrants out of the market or severely curtail their ability to compete in the market. A large number of non-price-based forms of discriminatory behaviour are also available for putative monopolists many involving the quality of service offered to other firms and usually identified under the catch all heading as ‘non-price discrimination’. Even if there is entry, for vertically integrated operators many of the same incentives to discriminate will exist or emerge over time (once the firm is established in the market).

A slew of regulatory obligations exist in Europe for Regulators to impose on dominant entities to control discriminatory behaviours. However, concerns have existed on the efficacy of these obligations to control price discrimination but more critically, to control non-price discrimination.

Wholesale Only operators have a large number of advantages when competing with vertically integrated operators from both a market and a regulated perspective. One of the principal advantages from a regulatory perspective is that these operators have no incentive to discriminate against customers since they have no preference for one retail operator over another.

However, the logic in the EECC behind the exemptions in Article 80 mean that cognisance must be given to the relationship between the different layers of the value chain – any links mean that exemptions meant to encourage investment could be used to leverage market power from one layer to another unless that separation is ‘absolute’.

Ljósleiðarinn should agree with FST’s conclusion Mila does not meet the conditions to be considered a Wholesale Only operator – it has a dedicated relationship and cross ownerships that remain important and that influence its position in the market. Ljósleiðarinn would also note that the context is different (as noted above) for a former incumbent given its historical position on the market – hence it is specifically set out in the EECC that the exemptions enjoyed under Article 80 do not apply to formerly vertically entities in the way that firms that enter the market as wholesale only do.

In practice, under the EECC, a wholesale-only operator can be expected to be essentially exempted from most access provisions and obligations, even where that operator is designated to hold Significant Market Power (SMP). However, such an Article 80 designation is different for a vertically integrated operator that chooses to vertically separate its operations. In such a case, even if a firm is designated as an Article 80 entity under the EECC, such a (formerly vertically integrated entity) has no guarantee that it will be eligible to be treated as a

"Wholesale-Only" operator under the terms of Article 80, or rather, it has no guarantee that it will enjoy the exemptions from access obligations that a firm that never had retail operations will enjoy.

Under Article 78 of the EECC dealing with voluntary separation it is noted that:

3. Without prejudice to Article 80, the legally or operationally separate business entity that has been designated as having significant market power in any specific market in accordance with Article 67 may be subject, as appropriate, to any of the obligations referred to in Articles 69 to 74 or any other obligations authorised by the Commission pursuant to Article 68(3), where any commitments offered are insufficient to meet the objectives set out in Article 3.

While the conclusion of FST that Mila is not designated as Wholesale-Only is correct, in practice, even if another conclusion is reached, it would not mean that Mila would or should enjoy the regulatory reliefs afforded to a firm that was never vertically integrated (such as Ljósleiðarinn).

4. Proportionality

Proportionality is a general principle of EU law[14]. It restricts authorities in the exercise of their powers by requiring them to strike a balance between the means used and the intended aim. In the context of the current market analysis, the geographic markets identified must be big enough to avoid a resource-intensive and burdensome micro-analysis that could lead to market fragmentation. In addition, the remedies considered ought to be judged relative to the outcomes sought.

More specifically, proportionality requires that advantages due to limiting any rights or the imposition of any obligations are not outweighed by the disadvantages to exercise the right or delivery of the obligations. In other words, the imposition of obligation or limitation on the right must be justified. Safeguards accompanying a measure can support the justification of a measure. A pre-condition is that the measure is both necessary and adequate to achieve the envisaged objective.

[14] The concept is defined in Art 5(3) TEU and in Protocol No 2 of that Treaty regarding the application of the proportionality and subsidiarity principles. The principle of proportionality is as well a foundational rule of Icelandic administrative laws.

Proportionality is an issue which does not receive sufficient attention. There are three particular issues, which are addressed here, namely in the first place, the fact that Ljósleiðarinn are accepted as being a 'Wholesale Only' operator implies that any remedies are not necessary by definition and secondly, that the cost of remedies on a market the size of Ölfus are excessive, no matter how 'light' those remedies might be considered and finally, the third point is that there may be consequences from imposing remedies in such a small market which are counter productive.

The obligations proposed on Ljósleiðarinn do not make sense in the context of it being a verified 'Wholesale Only' operator.

The analysis of FST in section 10.2 would seem to undermine the remedies that it proposes. Ljósleiðarinn are obliged to give access, to non-discriminate, to deal equitably and put prices on a fair and reasonable terms and finally, to have tariff monitoring and transparency.

However, the business of Ljósleiðarinn is giving access and it does not refuse access to any reasonable request. This is acknowledged by FST in its wholesale only assessment but also in paragraph 2792 where it makes Ljósleiðarinn current business practice of fair dealing, an obligation. Making current practice an obligation is illogical.

Ljósleiðarinn does not discriminate between customers who are in the same position, in fact, the economic logic behind the exemptions enjoyed by Wholesale Only operators is a recognition of the lack of incentives to discriminate between retail operators. Therefore, the rationale to impose an obligation which is in place in practice makes no sense.

The obligation regarding Fair and Reasonable pricing is also without logic. Ljósleiðarinn makes wholesale products available for sale on fair and reasonable prices because that is its business. In the jurisprudence of the EU, Fair and Reasonable pricing requires that prices are not so high as to act as an effective denial[15]. Such a pricing strategy would not make any sense for a company whose business is selling wholesale access (and only selling wholesale access).

Imposing tariff monitoring and transparency will require new systems at high cost

The seemingly innocuous obligation to monitor and report on pricing in Ölfus is disproportionate. Ljósleiðarinn has established its business and it business strategy and its business systems on a whole of Iceland basis. It does not have the internal control of systems

[15] See for example COM(2023) 232 and 2023/0133(COD) looking at Standard Essential Patents

to monitor one section of its network one region or another. To reorganise and put such OSS/BSS systems in place will be expensive and will require investments which are not justified in the context of Ölfus, a municipality which accounts for far less than 1% of the Icelandic market.

The remedies proposed risk creating separate markets in the future

The remedies proposed risk creating separate markets in the future because the Ljósleiðarinn business would be required to create separated account by local areas, identifying different costs with different pricing emerging (with actual geographic segmentation being created). In all this there is a risk that the fruits of competition in competitive areas will be lost through geographic differentiation of markets. For instance, where the competitive portion of the market, is geographically large, this may determine the outcomes for the whole national market. The regional market where only one network exists may act on the basis of the national market which is determined by the competitive area. In this way, even the customers in a monopoly supply area may enjoy the benefits of competition simply because the network owner operates on a national basis. Setting geographic markets in such a circumstances would break that constraint and possibly lead to worse outcomes for regional consumers. Note also, that a regional infrastructure monopoly does not imply the absence of competition at the service level. In case of open network access, customers still have the possibility to have the choice among different retail operators.

For instance, if FST persists in very narrow geographic market definitions as is the case with Ölfus, then the separation of offers and the requirement to make a separate and specific offer in Ölfus might mean that the competition that exists in Reykjavik does not set the pricing in this area which is much more remote.

There is a risk that a rush to defining regional markets within Iceland may deny consumers in less competitive areas the benefits of competition that spill over from more competitive areas where the Mila operates on a national basis. Identifying regional markets may, by itself, fragment the market. The definition of relevant market (national or subnational) should primarily take into consideration the market shares at wholesale and retail level. The presence of homogeneous retail offers at national level is a strong hint of a single national wholesale market.

The actual and prospective coverage of alternative operator's networks can be a useful for the subsequent assessment of the incumbent market power but it is not relevant for the assessment of market definition

According to FST results, retail prices seem to be almost always the same at national level; in such cases, geographical segmentation would appear to be odd and require extraordinary justification.

Conclusion

For a Wholesale-Only company like Ljósleiðarinn, the obligation to justify prices by reference to cost accounting (a) makes no sense and reflects a logic gap in the analysis and (b) does not reflect the reality of a nationally orientated business with nationally orientated accounts. The obligation to now hive-off a very small region is a disproportionate obligation (i) because of the cost relative to the size of that market and (ii) because there is no logic behind it.

5. The potential impact of the propose remedies on the Markets 3a/3b

There is insufficient consideration given to the potential consequences of segmenting markets in the way proposed by FST.

One consequence of a regional market approach is that it may mean that access seekers cannot make national offers if they must manage different inputs and different rules by area. This will increases transaction costs (having to manage and collate different inputs) and costs generally (since advertising and other factors will fragment and be done locally).

In this way, geographic segmentation becomes a self-fulfilling prophesy. As firms reorganise their business operations and strategies around this new wholesale reality, regional pricing may emerge and this will cement the geographic fragmentation.

For instance it is likely for instance that Ljósleiðarinn has incurred higher cost in the deployment of its network in Ölfus. Today, Ljósleiðarinn prices nationally, aware of the competition it faces particularly in Reykjavik and other urban areas and without reference specifically to anyone area such as Ölfus. However, if Ljósleiðarinn has to reorganise its business to produce separated accounts it may then choose to reflect in local pricing, the costs of network deployment.

There is a risk that defining regional markets within Iceland may deny consumers in less competitive areas the benefits of competition that spill over from more competitive areas such that identifying regional markets may, by itself, fragment the market. The presence of homogeneous retail offers at national level is a strong hint of a single national wholesale market.

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Tony Shortall

Brussels, 2 January 2024

6. Annex : Tony Shortall - Short Biography

Tony Shortall is Director of Telage, a consultancy in the field of telecommunications economics and regulation. He is an economist specialising in the regulation of network industries and is acknowledged expert in the area of telecommunications policy and regulation. Tony previously worked as senior economist at the European Commission and the Irish Competition Authority, Tony also worked in the telecommunications industry having worked with both fixed and mobile operators. He has written extensively on these matters and has advised governments, regulators and firms.

He holds degrees in economics (M.A.) and computers (B.A.) from University College Cork, Ireland and an LLM from the BSC in Brussels, Belgium.

Some relevant publications:

ALEXIADIS P., SHORTALL T., GUERRERO A., NIKOLINAKOS N., 2023 "COHESION vs FRAGMENTATION – INSTITUTIONAL CHALLENGES TO EU DIGITAL MARKETS REGULATION" Business Law International.

SHORTALL T. 2022 "European success in achieving very high capacity networks: a process of trial and error". VOL 23 ISSUE 6 Utility Law Review

BOURREAUX M., MAXWELL W. , SHORTALL T. 2020 "Cooperation between firms to deploy very high capacity networks" CERRE Report

CAVE, M. , SHORTALL, T. (2017) "Data Traffic Exchange: IP Interconnect – to regulate or not to regulate?" CERRE Report .

CAVE, M. , SHORTALL, T. (2016) "How incumbents can shape technological choice and market structure – the case of fixed broadband in Europe", INFO, Vol. 18

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SHORTALL, T. (2012), "Fibre Access: Network Developments in the OECD Area", OECD Digital Economy Papers, No. 182, OECD Publishing