Telecommunications Authority of Trinidad and Tobago

Consultative Document

on

Dominance in Termination Markets

(Second Round)

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Telecommunications Authority of Trinidad and Tobago

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List of Abbreviations

CPP — calling party pays

DPI — deep packet inspection

FTR — fixed termination rate

GDP — gross domestic product

GPON — gigabit passive optic networks

GSM — Global System for Mobile communications

HHI — Hirschman-Herfindahl Index

ITU — International Telecommunication Union

MCA — Malta Communications Authority

MTR — mobile termination rate

Ofcom —Office of Communications, UK

OTT — over-the-top

OUR — Office of Utilities Regulations, Jamaica

PLMN — Public Land Mobile Network

PSTN — Public Switched Telephone Network

SMS — short messaging service

SSNIP — small but significant non-transitory increase in price

TATT — Telecommunications Authority of Trinidad and Tobago

TRA — Telecommunications Regulatory Authority, Bahrain

TRC — Telecommunications Regulatory Commission, British Virgin Islands

UK — United Kingdom

UMTS — universal mobile telecommunications service

VOIP — voice over Internet protocol (VOIP)

Executive Summary

Call and short messaging services (SMS) termination services are traded in the upstream telecommunications market, i.e., between telecommunications operators, to allow the termination of calls from one network to another. Termination rates are the charges which one telecommunications operator charges another for terminating calls on its fixed and/or mobile network(s). Termination services are essential to a competitive telecommunications landscape as it eliminates the need for customers to subscribe to multiple networks in order to communicate with customers on those networks. Though termination services are integral to market competition, the markets for termination services are typically characterised by several distinct market conditions that give rise to an uncompetitive market, including the existence of dominance.

If the market is unregulated, dominant operators can hinder competitors or eliminate competition by delaying interconnection, degrading the quality of interconnection, or charging high prices for interconnection. High termination charges may increase retail prices to call both fixed and mobile numbers because of pass-through effects from the higher wholesale charge or because of competitive distortions created by excessive termination rates.

In keeping with the Authority's mandate to promote fair competition and an effectively liberalised telecommunications sector, the Authority undertook a competitive assessment of the local termination market. Based on the criteria outlined in section 29 of the Telecommunications Act, Chap. 47:31 (the Act), the Authority's economic and empirical analyses demonstrated that the "relevant markets" under review are defined as a voice call terminated to a called party's valid number range associated with PSTN and PLMN connections for which a termination charge is applicable, and SMS terminated to a messaged party's valid number range associated with PLMN connections for which a termination charge is applicable.

It has been investigated and proven that there is a lack of competitiveness in the relevant defined termination markets and the evidence strongly supports that fixed and mobile operators' pricing of termination services in Trinidad and Tobago is unconstrained by competition and therefore these operators are monopolists in each relevant termination market.

In accordance with the Act, the Authority proposes to designate each operator as dominant in the termination markets identified below:

Fixed Termination

i. market for voice call termination on TSTT's (called party) valid number range associated with PSTN connections for which a termination charge is applicable

ii. market for voice call termination on CCTL's (called party) valid number range associated with PSTN connections for which a termination charge is applicable

iii. market for voice call termination on Digicel's (called party) valid number range associated with PSTN connections for which a termination charge is applicable

iv. market for voice call termination on Prism's (called party) valid number range associated with PSTN connections for which a termination charge is applicable

v. market for voice call termination on Lisa Communications' (called party) valid number range associated with PSTN connections for which a termination charge is applicable

vi. market for voice call termination on Open Telecom's (called party) valid number range associated with PSTN connections for which a termination charge is applicable

Mobile Termination

i. market for voice call termination on Digicel's (called party) valid number range associated with PLMN connections for which a termination charge is applicable

ii. market for voice call termination on TSTT's (called party) valid number range associated with PLMN connections for which a termination charge is applicable

iii. market for termination of message (including SMS) on Digicel's (called party) valid number range associated with PLMN connections for which a termination charge is applicable

iv. market for the termination of messages (SMS) on TSTT's (called party) valid number range associated with PLMN connections for which a termination charge is applicable

1. Introduction

1.1. Rationale

This document is issued pursuant to the legal mandate of the Telecommunications Authority of Trinidad and Tobago (the Authority) to establish conditions for an open market that promotes effective competition. It focuses on fair interconnection practices — one of the core liberalisation issues impacting competitiveness.

Interconnection, as described in section 25 of the Act, refers to, "*the linking of public telecommunications networks and public telecommunications services, to allow the customers of one provider to communicate with customers of another provider and to access the services provided by such other provider*". Interconnection is a key wholesale service.[1]

There are three basic interconnection services which are traded in the wholesale market between operators. These are summarised below:

i. Call/SMS origination. Origination service provides the connectivity from a calling party's network to the point of interconnection[2]. The network of call or SMS origination is identified as the network that the customer used to initiate or place a call or SMS. Examples of origination services include local services, mobile services, national services, international services, freephone services[3] and Internet access services.

ii. Call/SMS termination. Termination is an interconnection service between operators providing connectivity from a point of interconnection to the called party's network termination point. Examples of termination services include local services, mobile services, national services, international services and premium rate services. Termination can take place on-net (on the same network on which the call or SMS was originated) and off-net (originated on one network but terminated on another network). Termination services are a subset of interconnection services (Minehane 2005).

iii. Transit services. Transit refers to the transmission and routing of call and SMS services of other operators over the network of an interconnection provider. Examples include calls from operator A to operator C through the network of operator B.

[1] "Wholesale telecommunications service" is an inter-operator service traded by operators (in the upstream market) which is required as an input for the provision of retail services to end users (retail customers in the downstream market).
[2] "Point of interconnection" means a point on the interconnection provider's network where physical connection is allowed to any interconnecting concessionaire, to act as a gateway between networks and enable the exchange of telecommunications services between or among networks.
[3] "Freephone" refers to a type of number translation service that allows a phone user to call a non-geographic number without incurring a charge. The freephone number can begin with 800.

Termination services are essential to a competitive telecommunications landscape as they eliminate the need for customers to subscribe to multiple networks in order to communicate with customers on those networks. In fact, according to surveys by the International Telecommunication Union (ITU), "interconnection issues are ranked by many countries as the single most important problem in the development of a competitive telecommunications marketplace" (Intven, Oliver and Sepulveda 2000).

Though termination services are integral to market competition, the markets for termination services are characterised by several distinct market conditions that give rise to an uncompetitive market, including the existence of dominance. The declaration of dominance in termination markets has been pronounced by many jurisdictions regionally[4] and internationally (see Appendix I) and can thus been described as an international precedent. This means that each provider of termination services can enjoy a position of economic strength affording it the power to behave, to an appreciable extent, independently of competitors with respect to terminating calls on its own network. Dominant operators can hinder competitors or eliminate competition by delaying interconnection, degrading the quality of interconnection, or charging high prices for interconnection.

For this reason, regulators and telecommunications advisory bodies have placed great scrutiny on the pricing behavior of terminating network operators. According to the World Trade Organization (WTO) GATs Telecoms Reference Paper, to which Trinidad and Tobago is a signatory, interconnection should be ensured on, amongst other things, "cost-oriented rates that are transparent, reasonable, having regard to economic feasibility, and sufficiently unbundled so that the supplier need not pay for network components or facilities that it does not require for the service to be provided."

Regulators typically mandate that cost-based rates are implemented by operators to ensure that termination charges are not the result of profiteering, and to prevent market failure, including anticompetitive pricing and acts of unfair competition towards new entrants and existing market operators. It should be noted that interconnection rates should only recover the costs associated with interconnection services. Where there is market failure relating to termination services, there will be significant consequences to operators and, ultimately, consumers in the market, as follows:

i. **Consumer impact**. Inter-operator termination services are an input to any concessionaire's provisioning of retail services. As such, operators may add any termination costs, at least in part, to their retail prices.[5] If operators set termination rates that are above the cost of providing these services[6], it is likely that this will be reflected in retail prices and result in higher costs to

[4] Jamaica, BVI, St.Lucia

[5] The degree to which input costs are reflected in retail prices is commonly linked to the level of competition in the market (i.e., it varies between 50% of the total cost change under a monopoly market structure to 100% under perfect competition) and the sensitivity of demand to prices. As demand for telecommunications services is typically inelastic (i.e., less responsive to price changes), one would expect a high pass-through rate in the context of telecommunications services.

[6] Cost-based regimes are regulatory regimes that specify and mandate cost-based interconnection services. These regimes vary according to jurisdiction and may include theoretical and mathematical models.

consumers of telecommunications services than would be the case under a cost-based interconnection charge regime.

ii. **Competition impact amongst existing operators**. In the scenario of symmetrical rates, above-cost termination rates increase the cost of off-net calls relative to the cost of on-net calls. This may lead to higher on-net:off-net price differentials at the retail level, as concessionaires pass on at least part of the higher cost of off-net calls to retail consumers. It has been argued that high on-net/off-net price differentials can, in some instances, distort retail competition, as larger operators may benefit from positive network externalities[7]. High on-net/off-net price differentials can further create a barrier to entry into the market, as small operators may struggle to attract customers from the (larger) exisiting operators in the market,

iii. **Market entry by new competitors**. The impact of above-cost interconnection rates on market entry is less clear. Whilst any expected incremental profits from higher interconnection rates could increase new bidders' prospects[8], new entrants are commonly net receivers of interconnection traffic (at least during the initial years). As such, higher interconnection rates are likely to increase any potential net interconnection payments from new entrants.

To prevent market failure related to interconnection services, the Authority seeks to facilitate fair and non-discriminatory termination practices between operators. This paper focuses on assessing the competitiveness of the termination market in Trinidad and Tobago, including investigations for dominance.

1.2. Background

The issue of dominance in termination markets was introduced in Trinidad and Tobago in 2006. At the onset of domestic telecommunications liberalisation, the arbitration panel established by the Authority to adjudicate the first dispute between Digicel and TSTT, explicitly tied a costing requirement to the interconnection market. On pages 21 to 22 of the "Digicel vs. TSTT Arbitration Decision No. 2/2006", dated August 16, 2006, it is stated that, *"Considering mobile termination is a monopoly market, the panel interprets the approach to cost-based charging in the Act and Concessions as originating from the expectation that there is likely to be a lack of competitive effects on interconnection charges that it is necessary to mandate by law and regulation that they be cost based, set pursuant to methodologies prescribed by the regulator…"*

[7] An externality is an effect (i.e. a cost or a benefit) that impacts a third party by a decision (i.e., to consume or produce) taken by another party. Since this cost (or benefit) does not affect the party that makes the decision, the latter does not, in general, take account of this cost/benefit in its decision. (Frontier Economics 2005)

[8] However, this may also result in inefficient entry into the sector, which could harm competition within the sector and ultimately consumers.

Following from this decision, the Authority prepared a *Costing Methodology for the Trinidad and Tobago Telecommunications Sector* (the Costing Methodology), which provided for, *inter alia*, a costing approach to be implemented by the dominant service provider, and noted that a "concessionaire that provides interconnection service shall be considered dominant in providing termination services on its network"[9] (TATT 2008).

The Authority is also obligated to appropriately define and assess markets to determine whether there are unfair practices, including dominance. According to section 29 (8) of the Act, the Authority may determine that an operator or provider is dominant where, individually or jointly with others, it enjoys a position of economic strength, affording it the power to behave, to an appreciable extent, independently of competitors, customers and, ultimately, consumers. To determine if a provider is dominant, the Authority should consider the following:

(a) the relevant market
(b) technology and market trends
(c) the market share of the provider
(d) the power of the provider to set prices
(e) the degree of market differentiation among services in the market
(f) any other matters that the Authority deems relevant

The Authority considers that the stated position of the arbitration panel and the Costing Methodology should be viewed in the context of the evolving telecommunications landscape, in compliance with its regulatory framework and, where applicable, consistent with international regulatory practices. The Authority has, therefore, reviewed standard international regulatory practices, which determined that it is not uncommon for regulators to declare all operators dominant in the provision of termination services under a calling party pays (CPP) regime. This review can be found in Appendix I.

1.3. Purpose

This report presents the Authority's full assessment of domestic termination markets and an assessment for market failure, including the existence of monopoly power, in accordance with its Regulatory Framework for assessing dominance. It also sets out the Authority's position on dominance in termination markets.

This formal review and position statement on dominance in termination markets:

i. assures stakeholders of regulatory certainty in the market, based on standard regulatory practices.

[9] See *Costing Methodology of the Telecommunications Sector of Trinidad and Tobago* (TATT 2008, 22)

ii. guides the Authority on matters relating to interconnection, pursuant to section 25 of the Act.
iii. guides the Authority on matters relating to section 29 (2) of the Act.
iv. establishes conditions for an open market, pursuant to section 3 (a) of the Act, by promoting competition and expansion of markets through the reduction of barriers to market entry.

1.4. Legislative Basis

1.4.1. Definitions of Dominance

The Act defines dominance and outlines the process for determining dominance as follows:

Section 29 (8):

> *For the purposes of this Part* (Price Regulation) *and wherever the issue of dominance otherwise arises in the Act, the Authority may determine that an operator or provider is dominant where, individually or jointly with others, it enjoys a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers and, for such determination, the Authority shall take into account the following factors:*
>
> *(a) the relevant market*
> *(b) technology and market trends*
> *(c) the market share of the provider*
> *(d) the power of the provider to set prices*
> *(e) the degree of market differentiation among services in the market*
> *(f) any other matters that the Authority deems relevant*

1.4.2. Consequence of the Declaration of Dominance

The Authority is authorised to regulate the prices of telecommunications services provided by dominant operators, in accordance with sections 29 (2), 29 (6) and 29 (8) of the Act.

Where dominance is found to exist, the Authority may impose price regulations, as may be necessary and appropriate, in accordance with section 29 (2) (a) of the Act, which states:

> *The Authority may establish price regulation regimes, which may include setting, reviewing and approving prices, in any case where there is only one concessionaire operating a public telecommunications network or providing a public telecommunications service, or where one concessionaire has a dominant position in the relevant market.*

On the subject of network interconnection, section 25 (2) (m) of the Act states that:

> *… the Authority shall require a concessionaire to … disaggregate the network and, on a cost oriented basis such as the Authority may prescribe, establish prices for its individual elements and offer the elements at the established prices to other concessionaires of public telecommunications networks and public telecommunications services.*

Furthermore, section 15 (2) (3) of the Telecommunications (Interconnection) Regulation (2006) mandates:

> *15 (2) Where the relevant data for the establishment of the costing methodologies, models or formulae are unavailable within a reasonable time, the concessionaire may set interconnection rates with reference to such costing benchmarks, as determined by the Authority, that comport with internationally accepted standards for such benchmarks.*
>
> *(3) A concessionaire shall within twenty-eight days of a written request from the Authority, unless this period is expressly extended by the Authority in writing, supply to the Authority such data as the Authority may require, for the purpose of determining that its interconnection rates are in accordance with this regulation.*

In light of the foregoing, the Authority will continue to establish the approaches set out under Regulation 15 of the Telecommunications (Interconnection) Regulations 2006, for the determination of interconnection rates.

1.4.3. The Legal Basis for Considering Dominance in Termination Markets

Section 3 of the Act requires the establishment of conditions for:

> *(a) an open market for telecommunications services, including conditions for fair competition, at the national and international levels;*
>
> *(b) the facilitation of the orderly development of a telecommunications system that serves to safeguard, enrich and strengthen the national, social, cultural and economic well-being of the society;*
>
> *(c) promoting and protecting the interests of the public.*

Further, interconnection service is derived from the demand[10] for a public telecommunications service and is, therefore, subject to the same legal review as any telecommunications service offered to the general public. As defined in the Act, interconnection is:

> *The linking of public telecommunications networks and public telecommunications services, to allow the users of one provider of a public telecommunications service to communicate with the users of another provider of a public telecommunications service, and to access the services provided by such other provider.*

Given this, and the Authority's regulatory powers as outlined in the previous section, the consideration of dominance in the provision of termination services is justified, legitimate and within the Authority's legal remit.

1.5. Consultation Procedures

In accordance with its *Procedures for Consultation in the Telecommunications Sector of Trinidad and Tobago* (ver. 2.0, 2010), the Authority sought the views of the general public and industry stakeholders on the first draft of this document, which was published on July 17, 2017, with a closing date of September 22, 2017.

The comments and recommendations received from the first round of consultation and the Authority's decisions on these comments and recommendations have been compiled in the Decisions on Recommendations (DoRs) in Appendix III.

The following revisions to the first consultative document were made:

a) The application of a detailed methodology for the assessment of the Trinidad and Tobago termination market, including:

    i. detailed market definition

    ii. consideration of retail market via empirical analysis

    iii. consideration of OTTs and potential impact on termination markets

Additionally, revisions were made to include section 2, which further explains the services of interconnection and termination.

[10]Derived demand is the demand for a factor of production, dependent on the demand for the good which uses it. (Sloan and Sutcliffe 2001, 334).

The Authority now seeks the views and opinions of the general public and other stakeholders on this revised consultative document. It will issue the revised framework for a second round of public consultation for a four-week period.

1.6. Definition of Terms

Where applicable, the following definitions shall be read in conjunction with the Act:

1. "The Authority" refers to the Telecommunications Authority of Trinidad and Tobago.
2. "Calling party pays" is the convention under which the party originating a call pays the entire end-to-end cost of the communication. In particular, in the mobile sector, this implies that the calling party pays the "airtime charge" for termination on the mobile handset. (Organisation for Economic Co-operation and Development (OECD) 2005)
3. "Concessionaire" means the holder of a concession, issued under section 21 of the Act as an approval to operate a public telecommunications network and provide a public telecommunications service or broadcasting service. In this document, reference to concessionaire does not include the holder of a concession to provide a broadcasting service.
4. "Freephone" refers to a type of number translation service that allows a phone user to call a non-geographic number without incurring a charge. The freephone number can begin with 800.
5. "Interconnection" means the linking of public telecommunications networks and public telecommunications services, to allow the users of one provider of a public telecommunications service to communicate with the users of another provider of a public telecommunications service, and to access the services provided by such other provider.
6. "Interconnection service" means a service provided by the linking of the public telecommunications networks or public telecommunications services of two concessionaires, to allow:

   (a) the users of the public telecommunications services of either concessionaire to communicate with the users of the public telecommunications services of the other.

   (b) access to the services provided by the other concessionaire.

7. "Joining service" means a service which gives access to elements of the investment undertaken by the interconnection provider, identified in interconnection agreements.
8. "Licence" means an authorisation issued pursuant to section 36 of the Act. Section 36 provides the conditions for authorising persons to establish, operate or use a radiocommunications service; install, operate or use any radio-transmitting equipment; or establish, operate or use any radiocommunications service on board any ship, aircraft, or other vessel in the territorial waters or territorial airspace of Trinidad and Tobago, other than a ship of war or a military aircraft or satellite registered in Trinidad and Tobago.

9. “Licensee” means the holder of a license to provide a service.
10. “Network termination point” refers to the point designated for connection of equipment by a user to a telecommunications network.
11. “Off-net (call/SMS)” refers to traffic originating on a service provider’s network (mobile/fixed) and terminating on another network (intra and inter service provider), e.g., a call originating on TSTT’s fixed network and terminating on Flow, bmobile or Digicel’s network.
12. “On-net traffic (call/SMS)” refers to traffic originating on a service provider’s (mobile/fixed) network and terminating on the same (mobile/fixed) network.
13. “Operator” is an owner or provider of public telecommunications services and/or networks.
14. “OTT” (over-the-top) refers to applications and services that are accessible over the Internet and ride on operators’ networks, offering Internet access services, e.g., social networks, search engines, amateur video aggregation sites, etc. (Mnakri 2015).
15. “Point of interconnection” means a point on the interconnection provider’s network where physical connection is allowed to any interconnecting concessionaire, to act as a gateway between networks and enable the exchange of telecommunications services between or among networks.
16. “Public telecommunications network” means a telecommunications network used to provide a public telecommunications service.
17. “Public telecommunications service” means a telecommunications service, including a public telephone service, offered to members of the general public, whereby one user can communicate with any other user in real time, regardless of the technology used to provide such service.
18. “Retail telecommunications service” refers to a telecommunications service provided to end user(s).
19. “Subscriber” is an end user or customer.
20. “Telecommunications” includes the transmission, emission or reception of signals, writing, pulses, images, sounds or other intelligence of any kind by wire, wireless, optical or electromagnetic spectrum or by way of any other technology.
21. “Telecommunications service” means a service using telecommunications, whereby one user can communicate with any other user in real time, regardless of the technology used to provide such a service, and includes a public telecommunications service, a private telecommunications service, a closed user-group service and a radiocommunications service.
22. “Termination markets” refer to markets for services provided by an interconnection provider to an interconnecting concessionaire, which links the public telecommunications networks or public telecommunications services of both concessionaires, in order to:

    (a) terminate traditional calls and SMS arising from interconnection between authorised parties at the network termination point so that users of the public telecommunications services of either concessionaire can communicate with the users of the public telecommunications services of the other.

(b) access the services provided by the other concessionaire (PSTN and PLMN Terminating Access).

23. “Termination rate” is the rate charged by the termination supplier to the service taker for use of its network for each unit (per minute or per SMS). This usage tariff applies to answered calls when the service taker (buyer of termination) routes the call to the service supplier’s (seller of termination) interconnection access area.
24. “Traditional calls” are voice calls terminating on PSTN networks (fixed) and PLMN networks (mobile).
25. “Traffic” is the registration on a telecommunications operator’s network (in units) of a transmitted, received and/or answered calls, SMS and/or data.
26. “Wholesale telecommunications service” is an inter-operator service traded by operators (in the upstream market) which is required as an input for the provision of retail services to end users (retail customers in the downstream market).

2. Interconnection Services Explained

2.1. Call and SMS Termination on Traditional PSTN and PLMN Networks

The provision of wholesale voice call termination services is needed to support the ability of callers to make voice calls to mobile and fixed users. Essentially, termination service provides the originating operator with access to the last leg of a call being made by one of its customers to the customer of the terminating fixed or mobile network operator, to allow the call to be completed.

Fixed and mobile telecommunications network operators also need to be connected to other operators' traditional PSTN and PLMN networks, so that customers of those different networks are able to call each other. Based on the interconnection agreements held between Trinidad and Tobago's operators, the functions of the PSTN and PLMN terminating access services are defined as follows:

i. "***The PSTN Terminating Access Service*** *provides conveyance of calls originating on a service taker subscriber connections via the service supplier PSTN from the point of connection defined by the Joining Service to the applicable service supplier PSTN subscriber connections in Trinidad and Tobago.*"

   Such calls must be addressed to valid number ranges associated with the service supplier PSTN subscriber connections.

ii. *"**The PLMN Terminating Access Service** provides conveyance of calls originating on a Service Taker's PLMN or PSTN* subscriber *connection from the Point of Connection defined by the Joining Service to Service Supplier's PLMN subscriber connections in Trinidad and Tobago, via the Service Supplier's PLMN and/or PSTN where appropriate."*

A graphical depiction of the local wholesale interconnection market is shown in Figure 1.

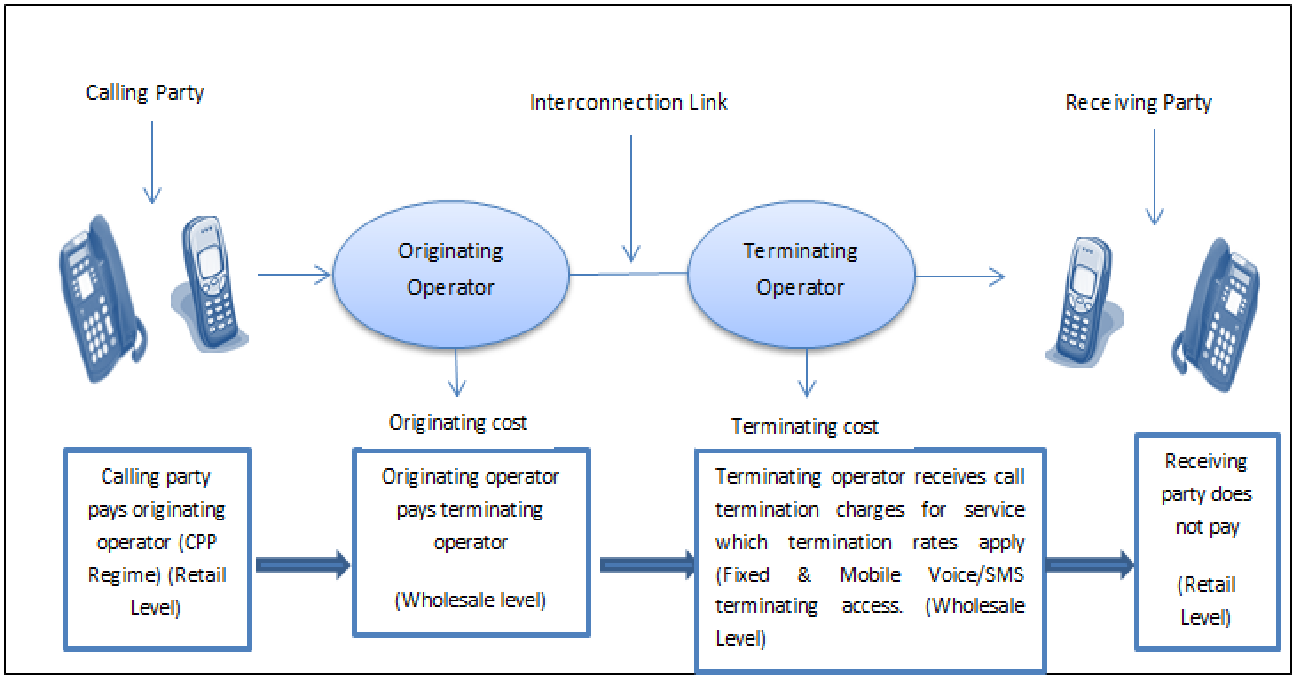

Figure 1. Interconnection Depicted
Source: TATT

2.1.1. Interconnection Tariffs and Payment Regimes in Trinidad and Tobago

Under the CPP regime, which is applicable in the Trinidad and Tobago telecommunications industry, the calling party, or the calling party's network, pays for the call. The recipient of the call pays nothing. Consequently, domestic retail voice operators pay a charge — fixed termination rate (FTR) or mobile termination rate (MTR) — to network operators for the delivery of voice call termination services. Both FTR and MTR represent one component of the cost of calls. There are a number of other services that support the delivery of a call, such as call origination, which usually carries the same cost as termination and transit, and attracts different charges.

In accordance with the general terms and conditions of interconnection agreements between operators in Trinidad and Tobago[11], terminating access service is provided by the service supplier (seller of termination) to the service taker (buyer of termination). When the service taker routes the call to the service supplier's interconnection access area, a usage tariff applies to answered calls. The duration of an answered call is measured from call start to call end. The termination supplier charges the service

[11] Interconnection agreements are submitted to the Authority in accordance with the concessionaire's obligations pursuant to subsection 25 (2) (f) of the Telecommunications Act, Chap. 47:31.

taker for use of its network for each unit of time (per minute). The service supplier is responsible for the metering and for billing the necessary charge to the service taker for all calls passed by the service taker to the service supplier for terminating access service.

This paper deals with the termination aspect of interconnection services carried over traditional PSTN and PLMN networks for which an interconnection charge or rate is applicable.

2.1.2. List of Interconnection Services included in Termination Markets

As the popularity of OTT services prevails within the evolving telecommunications landscape, wide debate surrounds its competitiveness and substitutability for traditional services. If there is significant substitution for traditional retail services by OTT services, then the argument can be made that it is irrelevant to examine traditional termination services at the wholesale level. However, within the context of existing interconnection agreements between local operators, no interconnection costs are assigned to OTT services, as these services are online services. By definition, online services depend on the Internet for their delivery, at least in part; consequently, no single network operator can guarantee the quality of the service delivered (Godlovitch, Scott Marcus and Kotterink 2015). In the provision of traditional call termination services over operators' PSTN and/or PLMN networks, the quality of the service is under the control of the respective operator(s) and can, therefore, be guaranteed to consumers and also be regulated by regulators.

Accordingly, OTTs do not require a PSTN terminating access service or PLMN terminating access service, as defined under section 2.1. However, whether OTTs influence the termination market in some way is explored in the market definition section of this Report. (See section 4.)

The following is a list of existing termination services for which a termination fee is payable to fixed and mobile network operators:

i. Call termination on PSTN network (fixed)
ii. Call termination on PLMN network (mobile)
iii. SMS termination on PLMN network

3. The Analytical Framework for Considering Dominance in Termination Markets

Having identified the existing termination services for which termination fees are charged, the Authority is mandated to undertake an assessment of this market to determine its level of competitiveness and/or the existence of dominance. The methodology employed in this assessment is based solely on the requirements set out under section 29 of the Act.

Section 29 (8) states:

> *"For the purposes of this Part and wherever the issue of dominance otherwise arises in the Act, the Authority may determine that an operator or provider is dominant where, individually or jointly with others, it enjoys a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers and, for such determination, the Authority shall take into account the following factors:*
>
> *(a) the relevant market;*
> *(b) technology and market trends;*
> *(c) the market share of the provider;*
> *(d) the power of the provider to set prices;*
> *(e) the degree of differentiation among services in the market;*
> *(f) any other matters that the Authority deems relevant."*

It is important to note that the execution of this mandate involves undertaking economic analyses. The following steps will be undertaken for the Trinidad and Tobago market:

- Product and geographic extent
- Demand- and supply-side substitutability

- Technology and market trends
- The market share of the provider
- The power of the provider to set prices
- The degree of market differentiation among services in the market
- Any other matters that the Authority deems relevant

The final or third step of a three-stage market review is the application of remedies. The Authority will consider implementing remedies only when necessary and proportionate to the degree of the competitive problem, including the abuse of dominance. The form of price regulation would be determined in accordance with the Act and any subsidiary regulations. For the period 2018 to 2020, the price regulation regime which the Authority will employ for regulating termination rates would be the outputs of the Interconnection Benchmarking Study[12], which is in accordance with Regulation 15 of the Telecommunications Interconnection Regulations.

[12] *Results of an Interconnection Benchmarking Study for the Telecommunications Sector of Trinidad and Tobago* TATT. 2017
https://tatt.org.tt/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=906&PortalId=0&TabId=222

4. Defining the Relevant Wholesale Market

Pursuant to the requirements set out in section 29 (8) (a) of the Act, it is necessary for the Authority to identify the "relevant wholesale market" (relevant market) before assessing dominance.

The relevant market to be analysed for the existence of dominance comprises all the services that are regarded as interchangeable or substitutable by the end user (i.e., customers at retail and operators at wholesale levels), based on the characteristics, prices and intended use of the services. This is done in two steps. Firstly, the specifications of the geographic extent (Step 1) of the market is determined and secondly, the services to be included in the relevant market are established (Step 2).

Wholesales services are inter-operator services traded by operators (in the upstream market) and used as an input towards the eventual provision of retail services (downstream market) to end users (retail customers). A list of existing wholesale services is provided under Condition A23 e (ii) of the Concession Agreement for the Provision of Public Telecommunications Services.

The following are the existing operators involved in the provision of termination services, whose interconnection agreements are filed with the Authority:

i. Columbus Communications Trinidad Limited
ii. Digicel Trinidad and Tobago Limited
iii. Lisa Communications Limited
iv. Open Telecom Limited
v. Telecommunications Services of Trinidad and Tobago Limited

4.1. Step 1 — The Geographic Market

The economic market definition process requires the specification of geographic extent of the relevant market. The geographic extent can be thought of as the arena in which the services are traded and where competition takes place. Table 1 gives details of the geographical markets for authorised concessionaires currently providing fixed and mobile services in Trinidad and Tobago. Since operators are mandated to provide inter-operator access (termination) to enable end-user communication, all fixed and mobile network operators are both originators and terminators of interconnection services.

Based on the fact that each operator is licensed on a national basis and offers geographically homogeneous termination services throughout Trinidad and Tobago, the geographic market, for the provision of termination services by fixed and mobile network operators, is national.

Table 1: The Geographic Market of Concessionaires Operating Fixed and Mobile Networks

Concessionaire	Network And/ Or Service	Territory
Columbus Communications Trinidad Limited	Public Domestic Fixed Telecommunications Services via a Public Domestic Fixed Telecommunications Network Public Domestic Fixed Telecommunications Network	National
Digicel Trinidad and Tobago Limited	Public Domestic Fixed Telecommunications Services via a Public Domestic Fixed Telecommunications Network	National
	Public Domestic Mobile Telecommunications Services via a Public Domestic Mobile Telecommunications Network	
Lisa Communications Limited	Public Domestic Fixed Telecommunications Services via a Public Domestic Fixed Telecommunications Network	National
Massy Technologies Infocom (Trinidad) Limited	Public Domestic Fixed Telecommunications Services via a Public Domestic Fixed Telecommunications Network	National
Open Telecom Limited	Public Domestic Fixed Telecommunications Services via a Public Domestic Fixed Telecommunications Network	National
Prism Services (Trinidad) Limited	Public Domestic Fixed Telecommunications Services via a Public Domestic Fixed Telecommunications Network	National
Telecommunications Services of Trinidad and Tobago Limited	Public Domestic Fixed Telecommunications Services via a Public Domestic Fixed Telecommunications Network	National
	Public Domestic Mobile Telecommunications Services via a Public Domestic Mobile Telecommunications Network	

Source: Concession List TATT[13]

4.2. Step 2 — The Relevant Service Market[14]

The economic market definition process also requires the identification of the range of service(s) for which the behaviour of operators is to be analysed. The identification of this market boundary begins with the smallest service or set of services provided by operators in the proposed termination market. In considering the termination market, the Authority identified the narrowest (smallest) market or focal product/service and thereafter evaluated the boundaries of the relevant market by testing the level of competitive constraints faced by providers of termination services.

Concession Condition (TATT 2007, 13) A23, e (ii) specifies the following wholesale telecommunications services[15]:

"d. Mobile termination services (national only)

e. Fixed termination services (national, major territorial, minor territorial, niche)"

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[13] *ttps://tatt.org.tt/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=889&PortalId=0&TabId=222*

[14] More commonly called the relevant "product" market in competition analysis and case law

[15] Wholesale services are services provided to telecommunications operators for the provision of retail services.

Furthermore, in accordance with the description of services pursuant to local interconnection agreements[16], an interconnection charge is applicable when calls/SMS are terminated on an operator's PSTN and PLMN network(s).

In this case, the smallest set of services to be included in the relevant market is therefore a voice call/SMS terminated to a called party's number associated with PSTN or PLMN networks connections for which a termination charge is applicable. Accordingly, the Authority considers the following as the appropriate and applicable products to be examined:

i. a voice call terminated to a called party's valid number range associated with fixed network connections (a.k.a. PSTN connections), for which a termination charge is applicable
ii. a voice call terminated to a called party's valid number range associated with mobile network connections (a.k.a. PLMN connections), for which a termination charge is applicable
iii. an SMS terminated to a messaged party's valid number range associated with PLMN connections, for which a termination charge is applicable

The next consideration in determining the relevant market is to assess the need to widen the relevant service market for wholesale fixed and mobile termination services, to account for the number of possible substitutes or alternative services available to customers in the event of a price increase in termination charges, in the short term. This assessment was undertaken by assessing both potential retail and wholesale substitutes.

4.3. Retail Market Analysis

4.3.1. An Overview of Existing Fixed and Mobile Retail Markets

There are two mobile network operators in Trinidad and Tobago (i.e., TSTT/bmobile and Digicel) and there are a number of fixed network operators (including TSTT, Digicel, CCTL/Flow and Lisa Communications). These operators are mandated to provide inter-operator access (termination services) to enable end-user communication. A summary of the market statistics relating to the fixed and mobile domestic voice markets is provided in Appendix II.

In the case of the mobile market, it is the only market in Trinidad and Tobago's telecommunications sector with only two operators. The increase in mobile subscriptions observed in 2016 contributed to a

[16] Detailed in section 2.1.1 Interconnection Tariffs and Payment Regimes in Trinidad and Tobago, of this document.

rise in the mobile penetration rate, which stood at 160.0 as at December 2016, representing an approximate increase of 1.7% over 2015. This market is a strong revenue earner, contributing 34% to total telecommunications and broadcasting revenues for the year 2016, where total revenue was TT$1,889.6 million, equating to 3.1% of gross domestic product (GDP). This market displays a fairly constant Hirschman-Herfindahl Index[17] (HHI), at a level of approximately 5000 for the past eight years, indicating only moderate competition, and implying a strongly entrenched duopoly *(Telecommunications and Broadcasting Sectors Annual Market Report, TATT 2016, 61).*

Consumption of fixed voice services in Trinidad and Tobago increased in 2016. The market's penetration[18] figure stood at 54 per 100 households in 2016, up 2% year on year. This increase in fixed voice penetration indicates an improvement in the uptake of fixed voice services. Gross revenues received from all fixed voice services totalled TT$723.5 million, accounting for 12.9% of total telecommunications and broadcasting revenues for 2016. Consistent with the overall decreasing trend, the fixed voice market's HHI for 2016 was recorded at 7,567, which represented a decrease by 8% when compared to the previous year. This reflected a significant decrease in the level of concentration in the said market *(Telecommunications and Broadcasting Sectors Annual Market Report, TATT 2016, 42).*

4.3.2. Demand-Side Substitution at the Retail Level

4.3.2.1. The SSNIP Test

A market boundary can be defined by asking whether it would be profitable for a hypothetical monopolist to impose a small but significant (at least 5%), non-transitory increase in price (the SSNIP test) on a given product/service or group of products/services.

Even though termination services are provided in the upstream telecommunications market, competitive constraints at the retail level may impose an indirect constraint on the wholesale market, since it is argued that some proportion of any wholesale price increase is likely to be passed on to the

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[17] The Hirschman-Herfindahl Index (HHI) is a tool that measures the concentration of firms within a particular market. It is computed as the sum of squares of the market share of all firms within a particular market and ranges from approximately 0 to 10,000.

[18] Fixed line household penetration = (number of residential fixed voice subscriptions / total number of households) *100 *(Telecommunications and Broadcasting Sectors Annual Market Report TATT 2016)* *https://tatt.org.tt/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=983&PortalId=0&TabId=222*

retail level[19] and may result in consumers switching to alternative or substitutable products. If retail substitution can sufficiently limit the ability of a wholesale operator to profitably raise wholesale prices by any significant amount (at least 5%), an indirect constraint exists. Accordingly, the Authority reviewed whether consumer choice imposes such indirect constraints on operators at the wholesale level.

In the considerations of the local retail market, the Authority investigated the effect of a SSNIP on the profitability of termination services, assumed to be supplied by the hypothetical monopolist. The hypothetical monopolist in this test refers to a profit-maximising operator that is the only present and future producer or seller of termination services on its own network in Trinidad and Tobago. If the hypothetical monopolist can introduce a SSNIP and maintain profitability, then the market is "defined", meaning there are no substitutes available to pose competitive constraints on the hypothetical monopolist.

Based on the findings of a SSNIP, consumers will respond to an increase in the price of calls to a specific fixed or mobile number, by switching to an alternative if they are sufficiently aware of the price increase and deem it sufficiently material to react to.

The following outlines the steps and findings of the analysis undertaken:

Step 1 — The Hypothetical Price Increase

When a hypothetical price increase of 5% of the current domestic fixed and mobile termination rates was computed, this increase was minimal and not more than one cent or TTD$0.01. (The computed increased price is not disclosed in this report due to the confidentiality of termination rates in Trinidad and Tobago). When this 5% increase was applied to prevailing retail rates, the effective price increase reflected in fixed and mobile calling retail rates per minute were $0.005 and $0.01, respectively. The change in price at the retail level was, therefore, less than 1% (approximately less than one cent). For example, the mobile calling rate will increase from $1.13 to $1.14 for one operator and $1.10 to $1.11 (VAT exclusive) for the other mobile operator.

[19] Indirect constraints arise because wholesale price rises may be passed through to the retail market, causing retail consumers to switch away, and therefore lowering wholesale volumes. Such indirect constraints might lead to products being included in the same relevant market, even if those products do not constrain each other directly at the wholesale level. (Ofcom 2015)

Step 2 — Consumer Response

A price increase of less than 1% (which translates to approximately less than one cent) is not sufficient or material to effect consumer response, which is measured by change in the demand for retail calls. This finding is empirically supported by the analysis presented in section 4.3.2.2. It is also unlikely that retail consumers would be aware of the hypothetical price increase of 5% on termination rates and deem this same price increase sufficiently material to be worthy of a reaction, measured by consumer switching. Preissl, Haucap and Curwen (2009) opined that empirical evidence has demonstrated that the cross price elasticity of retail mobile services with respect to the price of mobile termination is relatively small, both in terms of absolute and relative magnitudes, compared to that of other mobile cross elasticities[20]. Accordingly, , subscribers care more about the charges they pay than about the charges a subscriber to another network pays due to the components of prices (including wholesale charges) (Preissl, Haucap and Curwen 2009). In addition, with the implementation of number portability in fixed and mobile markets, consumers may not be able to identify the network destination based on the called party's number and thus would not be cognisant of, and sensitive to, wholesale prices. Based on a global analysis of consumer response, consumers will not switch to alternative means of communicating due to a 5% increase in termination rates.[21] Analyses presented in sections 4.3.2.2 – 4.3.2.4 also quantitatively support this finding for Trinidad and Tobago.

Given the less than 1% increase in fixed and mobile retail calling rates, there is no material consumer switching and thus operators' behaviour at the wholesale level is unconstrained for a 5% SSNIP. This gives the preliminary conclusion that the termination market is a market on its own.

4.3.2.2. Own-Price Elasticity of Demand for Fixed and Mobile Retail Services

In addition to the SSNIP analysis presented above, the Authority undertook a review of price sensitivity in the domestic fixed and mobile retail markets, for price changes above 1%. The measure of the relationship between changes in the quantity of voice calls demanded and a change in its price (price elasticity of demand) was computed to determine responsiveness of consumers in the fixed and mobile market. If this response is inelastic,[22] consumers' demand is relatively unchanged and suggests there is little or no demand-side substitution. Thus, the service provider is unconstrained by consumer

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[20] For example, in a study produced by the Competition Commission 2003, Oftel found that the cross elasticity was so small it could easily be disregarded.

[21] This is also consistent with recent findings of Ofcom in its 2015 – 2018 market termination review. It stated, "*Even if a 5-10% MTR increase by all MCPs were fully passed through into retail prices, the resulting percentage increase in retail prices would be much smaller. This is because MTRs make up only a fraction of the underlying costs of calls, and an even smaller fraction of the cost of bundles that include calls, texts, and/or data.*"

[22] The demand for a good or service is described as inelastic when a percentage change in price results in a less than proportionate change in quantity demanded.

behaviour in the demand for its services, which will form the relevant market. If, however, the response to a change in price is elastic[23], service suppliers are constrained by consumer behaviour and the boundaries of the market should be expanded to include other services.

Trinidad and Tobago's termination pricing data for the period 2012 to 2015 were assessed via regression and point analyses to determine the responsiveness of consumers.

4.3.2.2.1. Own-Price Elasticity of Demand for Fixed Voice Services

The regression results showed that the price per minute of retail fixed voice calls was significant in explaining movement in the quantity of fixed voice minutes demanded. The analysis also showed that price per call was also very significant in explaining the demand for a minute of fixed voice talk. Both variables produced inelastic explanatory coefficients. For ease of interpretation, the "per minute of talk" variable was used, which had a coefficient of -0.944. This may be interpreted that for a unit increase in price per minute of talk, quantity demanded would fall by a less than proportionate amount. This, therefore, implied that demand for domestic fixed voice talk was overall inelastic and not overwhelmingly responsive to changes to the service price.

Table 2: Domestic Retail Fixed Voice Demand Regression Results (2012:2013)

Source	SS	df	MS
Model	.060972312	3	.020324104
Residual	.018634115	20	.000931706
Total	.079606427	23	.003461149

Number of obs	=	24
F(3, 20)	=	21.81
Prob > F	=	0.0000
R-squared	=	0.7659
Adj R-squared	=	0.7308
Root MSE	=	.03052

logfixedmin	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logarmin	-.943784	.1998842	-4.72	0.000	-1.360735	-.5268328
logarminmobfix	-.6960016	.2890457	-2.41	0.026	-1.29894	-.0930627
logbbarsub	-.1588562	.3369995	-0.47	0.642	-.8618248	.5441125
_cons	18.57717	1.604972	11.57	0.000	15.22926	21.92508

Source: Monthly market data supplied to the Authority

With respect to a point elasticity measure, the following table shows that demand for one operator's domestic fixed voice talk was overall inelastic for the point reviewed and was not overwhelmingly responsive to changes in the service price. This may further imply that, for a given increase in price per minute of talk, quantity demanded would fall by a grossly less than proportionate amount.

[23] The demand for a good or service is described as elastic when a percentage change in price results in a more than proportionate change in the quantity demanded or supplied.

Table 3: Actual Point Elasticity of Demand (2014:2015)

[redacted] **Quantity Demand**	**Calls**		
AVG 2013-2014	[redacted]	[redacted]-2014	[redacted]
AVG 2014-2015	[redacted]	[redacted] 2015	[redacted]
% ΔQd	**-0.133**		**-0.042**
[redacted] 2014	[redacted]		[redacted]
[redacted] 2015	[redacted]		[redacted]
%Δ P	**0.324**		**0.324**
PED	**-0.41**		**-0.13**

Note to Table 3: Figures are redacted from this document due to the confidentiality of individual operator data.

4.3.2.2.2. Demand for Mobile Voice Services

For the mobile retail market, the Authority calculated the point elasticity for a price change by one operator in March 2015. The results showed that the increase in price per minute of mobile talk time resulted in a less than proportionate fall in quantity demanded. The computed price elasticity of -4.73 indicates that demand for mobile voice calls is price inelastic, *ceteris paribus*. This suggests that there is little or no demand-side substitution since consumers' demand was relatively unchanged. The service provider is, consequently, unconstrained by consumer behaviour in the demand for mobile calls. The elasticity of demand, based on said price increase, is calculated below.

Actual price elasticity can be estimated using the following formula:

$$\text{Actual Price Elasticity of Demand} = \frac{\%\ \Delta \text{ in Subscribers}}{\%\ \Delta \text{ Price}}$$

Table 4: Actual Point Elasticity of Demand (2015)

[redacted] Actual Point Elasticity of Demand 2015

	X's Price	Minutes Demanded[24]
2015	[redacted]	[redacted]
2016	[redacted]	[redacted]
Difference	[redacted]	[redacted]
% Change	5.73%	-27.09%
Price elasticity of demand[25]	-27.09/5.73 = 4.73%.	
Price elasticity of demand	**-4.73%**	

Note to Table 4: Figures are redacted from this document due to the confidentiality of individual operator data.

In summary, the analysis of the product market reveals that, on the basis of a 5% SSNIP, consumers will not respond to an increase in the price of termination rates, as they will not be sufficiently aware of the price increase and, furthermore, would not deem the same price increase adequately material to react to at the retail level. This finding is also supported by the estimated inelastic cross price elasticity of demand between termination and retail services and the inelastic estimated point elasticities of demand derived from the local fixed and mobile telecommunications market. Consequently, based on the local review and analysis undertaken, there is no evidence to suggest that the termination market is not a market on its own.

4.3.2.3. Degree of Substitutability of Wholesale Services

Notwithstanding the fact that the SSNIP test proves that wholesale is a market on its own, and that consumers are not responsive to retail price changes (including those based on a wholesale price increase), the Authority assessed the need to widen the relevant product markets for termination services, to account for alternative services that may be considered to be substitutes by consumers.

[24] Minutes demanded for period (nine months before and after)

[25] Elasticity of demand is change in the quantity demanded divided by the changes in price.

Based on feedback attained in the first round of consultation, operators have identified OTT services and retail service substitution as factors at the retail level that impact termination markets. The Authority analysed whether or not there are retail services that substitute for termination services. The following switching options for consumers will be analysed:

i. Fixed-to-mobile substitution
ii. Mobile-to-OTT substitution

4.3.2.3.1. Fixed-to-Mobile Substitution

Mobile voice services usually constitute a separate market from fixed voice. However, evidence from recent years suggests that the boundaries between those markets have become less clear.[26]

The Authority had previously reviewed the issue of fixed-to-mobile voice substitution and found that they are not part of the same market for the following reasons:[27]

i. Mobile services allow customers to receive calls anywhere, while fixed services do not.
ii. Mobile messaging services are only available on mobiles, not on fixed telephones, which might limit the degree of substitutability between fixed and mobile phones. The majority of customers who have fixed voice services also have mobile voice services, which suggests that the two may be complimentary rather than substitutes.

The Authority believes that these conclusions still hold true today, as there is no material evidence to suggest that any of the arguments above have become less substantial. Even if the price of mobile calls increases and consumers decide to switch to fixed services or vice versa, the switched option would still require the calling party's network to terminate the traditional call to the called party. This means that whether the choice is made to use a fixed or mobile calling option, in any of these scenarios, termination on the called party network is required.
The focal product/service is a voice call terminated to a called party's valid number range associated with PSTN/PLMN connections for which a termination charge or rate is applicable. Therefore, fixed and mobile voice customers cannot bypass network termination when a choice and/or decision has been made to place a traditional call. Under the current and foreseeable circumstances, the desired party can only be reached via the called party's network and the calling party is limited by the assigned number. Termination on the called party's network is unavoidable.

[26] BEREC, "Report on Fixed - Mobile Substitution in Market Definition", 08.12.2011, http://berec.europa.eu/doc/berec/bor/bor11_54_FMS.pdf
OECD, "Fixed and mobile networks: substitution, complementarity and convergence", 08.10.2012 http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP%282011%2911/FINAL&docLanguage=En
[27] The economic market definition process Trinidad and Tobago, TATT, 14.04.2009, 12–13 https://tatt.org.tt/Portals/0/documents/Determination%20of%20Market%20Definitions%20in%20the%20Retail%20Domestic%20Fixed%20Voice%20Sector.pdf

Consequently, the Authority considers that call termination is not substitutable for callers on fixed and mobile networks, *ceteris paribus*. More importantly, mobile and/or fixed calls are not a substitute for termination.

4.3.2.4. Substitution of a Mobile-to-Mobile Call with OTTs

At present, a huge volume of communications traffic is shared across Internet services such as VoIP, peer-to-peer, social networking, e-mail, instant messaging, blogs, forums, video conferencing etc., whilst traditional telecommunications still focus on providing fixed and mobile voice, SMS and MMS services (IBM Global Business Services 2010). Applications and services that are accessible over the Internet and ride on operators' networks, offering Internet access services, are referred to as over-the-top (OTT) and include social networks, search engines, amateur video aggregation sites, etc. (Mnakri 2015).

OTTs have created a value ecosystem and this environment is far more dependent on Internet and bandwidth requirements than traditional services, thus greatly contributing to the huge growth of data usage and increase in data traffic.

Domestic operators (in response to the first round of consultation) have identified OTT service substitution as a factor at the retail level that poses a real constraint on termination markets.

However, the Authority notes that some OTT services do not use mobile or fixed telephone numbers to establish a voice call between users and thus do not attract a termination fee. The Authority is also of the opinion that there are marked differences between OTT-based VoIP and fixed voice calls, which might make them less substitutable. These are listed below:

i. OTT-based VoIP services do not always allow for any user to connect with any user in the telephone network or with users of competing OTT-based VoIP services. A Skype-to-Skype call, for example, would require both sides to install the software in advance. These calls are unmanaged in the origination and termination segments. This leads at times to lower quality of calls, lags, cut offs and so on.
ii. Availability at the terminating segment is somewhat lower than that of voice calls. For example, a call originated from Skype to a mobile handset with a Skype application on it might not connect if the terminating handset is within 2G coverage, or if the terminating user has maxed out his or her data allowance.
iii. Some callers may find these services less easy to use compared to more traditional fixed telephones, as they require some ability to operate a computer or a smartphone.

Furthermore, despite the increased popularity of OTT applications, there are still a significant number of end users who rely on traditional networks for communicating. VoIP applications do not offer any interoperability between different platforms and require that end users have simultaneous access to the Internet and the same OTT application[28].

Taking all evidence into account, the Authority has considered that, on balance, OTT-based VoIP services may not fall within the market definition for fixed voice services at the retail level, at this time. Ofcom (2017) also noted that the use of OTT services is unlikely a substitute for mobile voice calls. A potential measure of the substitutability at the retail level would require the use of a key network tool for the analysis of OTT usage called a deep packet inspection (DPI) facility. Where operators have employed these facilities domestically, the data should be shared with the Authority, so that quantitative information can be considered in the assessment of the local impact of OTTs.

More importantly, any unmeasurable constraint imposed by OTTs on retail mobile/fixed voice calls is not the point at issue. Rather, the relevant point is whether a consumer of retail mobile/fixed voice calls would, specifically, in response to a 5% increase in the FTR/MTR, switch to a competing retail product.

Based on the previous SSNIP test, there is a distinct separation between retail and wholesale and, therefore, potential competition between services of any defined retail market is not induced by a SSNIP in the termination market. In conclusion, for the purpose of this assessment, the relevant market for wholesale voice services should not be extended to include any potential substitute of OTT-based VoIP services.

In summary, the analysis of substitution in the product market reveals that retail fixed and mobile services and OTTs are **not** substitutes for wholesale call termination. Consequently, the Authority considers that wholesale call termination is a market on its own.

[28] The use of an OTT application is not a close substitute for calls to a mobile number. (Ofcom 2015)

5. Analysis of the Defined Market

Having identified the "relevant market", an assessment of dominance was carried out to determine whether the relevant market is effectively competitive. To identify a dominant undertaking in a relevant market, the Authority utilised a number of economic criteria, as laid out in section 29 (8) of the Act. Consequently, in the Authority's review, the following criteria were analysed, pursuant to section 29 (8) of the Act:

i. Technology and market trends
ii. Market share analysis
iii. Power of the provider to set prices
iv. The degree of differentiation among services

5.1. Technology and Market Trends

Currently, a range of technologies are utilised by operators for the provision of fixed and mobile retail services. TSTT offers fixed voice services through its public switched telephone network (PSTN), CCTL via its Hybrid Fibre Coaxial Network, and Digicel (Trinidad and Tobago) Limited provides fixed voice services through its gigabit passive optic networks (GPON)[29]. Open Telecom Limited and Lisa Communications Limited offer fixed voice services via their fixed wireless networks. Prism Services (Trinidad) Limited offers hosted PBX services.

The technologies used for the provision of mobile voice services in Trinidad and Tobago may be more widely known by consumers. These include:

i. **Global System for Mobile communications (GSM)** — GSM networks are actively used for voice services, in conjunction with data enhancements, GPRS and EDGE, and with other more recent generations of data services.
ii. **Universal Mobile Telecommunications Service (UMTS)** — UMTS networks are currently deployed for voice services, in conjunction with data enhancements HSPA and HSPA+.
iii. **Long Term Evolution (LTE), Frequency Division Duplexing (FDD)** – LTE-FDD network is currently deployed for data services only, for higher data speeds than the HSPA+ technology

The Authority has identified the focal service as a voice call terminated to a called party's valid number range associated with PSTN or PLMN connections, for which a termination charge is applicable. Accordingly, regardless of the technology utilised to terminate calls/SMS, termination charges are applicable for the termination service (which is undifferentiated, and presented in section 5.4) and thus the termination services under review are only identified as termination services for which a termination charge is applicable.

Telecommunications and Broadcasting Sectors Annual Market Report TATT 2016 https://tatt.org.tt/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=983&PortalId=0&TabId=222

Termination can, therefore, take place via 2G, 3G and 4G networks. At the retail level, when callers initiate a call to the called party's mobile phone, they (and their originating network) have no control over the technology used to terminate the call. Calling parties will very often be unaware of which technology is used. Moreover, calls to a particular called party's mobile phone may terminate using different technologies during the same call (e.g., moving from 3G to 2G).

Furthermore, based on existing traditional networks such as Trinidad and Tobago's, a traditional call can only be terminated using the receiving subscriber's host network. This is an absolute technical barrier to entry[30]. While a consumer can make a selection of a carrying network, terminating access (at the point of interconnection) cannot be provided by a third party because the infrastructure cannot be duplicated to offer a substitutable service. There is, therefore, a high barrier to entry (both in terms of the likelihood of actual entry and the threat of potential entry by a new market entrant), and the fact that any new entrant cannot be a substitute for termination services on another public operator's network.

The absolute technical barrier to entry, and the fact that there are no effective substitutes for traditional call termination on a given network, indicates that there is a lack of competitiveness in the termination market.

5.2. Market Share Analysis

As discussed in the market definition section, termination of particular calls can only be made on the particular called party's valid number range associated with PSTN or PLMN connections for which a termination charge is applicable and there are no effective substitutes for traditional call termination on a given network.

As a result, all providers of termination services have an implicit (100%) share in both volume of, and revenues for, termination services over their own network(s). Consequently, there is a strong presumption of monopoly power. In the absence of regulation, network operators can set termination charges above cost and competitive levels.

[30] The Office of Utilities Regulation (OUR), Jamaica, stipulated that the monopoly problem originates from the innate technological elements of interconnection, where an operator can increase its termination rate above the competitive level, unaffected by other operators, since all operators rely on each other to terminate the calls or messages of their subscribers. This is likely to be reflected in higher retail charges for end users.

5.2.1. Supply-Side Substitution[31] Test

In analysing supply-side substitution, the Authority considers whether a hypothetical increase in termination rates above the competitive price would attract, in response, new entrants in termination markets. Given the inherent design of networks, no other operator or new entrant can offer termination services for another operator's network. Therefore, if a hypothetical monopolist (named A) increases the price of its termination services, an alternative network operator would not be able to provide A's termination services. The alternative operator can only increase its termination price to match A's. The Authority, therefore, considers that there is no effective supply-side wholesale substitute for termination. Without competitive constraints, this creates market conditions that allow the terminating operator to increase its termination charge.

The Authority, therefore, concludes that all fixed and mobile operators have 100% of the market of calls and messages that require termination on respective networks. Examples include traditional calls/SMS to network identification numbers of Digicel, Flow, Lisa Communications, Open Telecom and TSTT. This is indicative of dominance, as each operator is a monopoly for terminating traffic on its own network.

5.3. The Power of the Provider to Set Prices

5.3.1. Countervailing Buyer Power

Countervailing buyer power arises when a large customer or group of customers can impose a competitive constraint on the termination rates charged by an operator (Malta Communications Authority (MCA) 2006). The technological barriers[32] limit the countervailing buyer power of any operator when purchasing termination rates from other operators[33].

The inherent technological barriers and the obligation to interconnect make the terminating operator dominant over its own network and, therefore, the number of operators in the market has very little impact on termination rates.

[31] Supply-side substitutability arises when suppliers are able to switch production or other resources to the relevant products and markets in the short term without incurring significant additional costs or risks, in response to a small but permanent increase in the relative price of a product. (Malta Communications Authority)

[32] The originating operator cannot successfully terminate the call of his subscriber by terminating that call on a different network other than the one to which the number is registered.

[33] For example, the Malta Communications Authority considered that, in the absence of appropriate regulation, the fixed telephony incumbent will not face a competitive constraint from any other operator or group of customers in order to constrain termination rates.

The provider has all power in setting termination price due to the absence of countervailing buying power for voice calls terminated to a called party's valid number range associated with PSTN and PLMN connections for which a termination charge is applicable.

5.3.2. The Demand-Side Substitution[34] Test

In terms of traffic distribution at the wholesale level, given the number of players in the mobile market, it is likely that domestic traffic terminating, for example, to mobile network operators (A) and (B), originates from both the other mobile operator's subscribers as well as from other fixed operators' subscribers in Trinidad and Tobago.

It is, therefore, likely that one or both mobile operators could have greater inbound mobile traffic relative to outbound and, therefore, any change in termination rates can impact or benefit operators based on the proportion of call volumes they terminate to the mobile networks of A and B. An operator's opportunity to gain from increased termination rates due to the differential in traffic can increase its incentive to set termination charges above costs and competitive levels.

Similarly, from the reverse perspective, the revenues fixed operators receive from the termination of calls to their respective fixed networks could increase under higher termination fees in direct proportion to their fixed call volume received. That said, given that traffic terminating to each fixed operator's network originates from other fixed networks as well as mobile networks, it is likely that some or even most fixed operators could have greater inbound fixed traffic relative to outbound. Therefore, the increases in fixed termination rates would likely impact fixed operators payments and revenues in proportion to traffic terminated.

Faced with a SSNIP, the buyer of termination services (that is, the operator whose customer is calling a subscriber of the terminating operator's network) cannot substitute wholesale call termination services supplied by a third operator. There are no effective substitutes for the caller who wishes to call a given party's fixed or mobile connection via the traditional network. Whether or not a consumer owns multiple handsets or multiple SIMs is irrelevant, given that a subscriber or a network registered telephone number cannot substitute where it terminates with another subscriber or network registered telephone number. A hypothetical monopolist could, therefore, profitably increase its price above the competitive level without being constrained by competition or potential competition.

Operators have the power to set prices without a negative impact on termination profitability. Under the existing CPP regime in Trinidad and Tobago, there is no other alternative to calling numbers

[34] Demand-side substitutability seeks to identify the range of products that may be viewed as reasonable substitutes for one another by the users of those products in the case of a price increase. End users will regard products/services as being interchangeable based on the products' characteristics, price and/or the intended use/s.

controlled by that provider (via traditional networks). There is no countervailing buying power as terminating buyers have no alternatives and also cannot produce termination services for other networks. Therefore, existing operators cannot impose competitive constraints on the termination rate charged by another operator.

The potential for gains under the CPP regime, as indicated earlier increases the likelihood of operators charging prices that may be decoupled from cost and are in the interest of monopolist profits. Under the CPP regime, network operators have few or no incentives to lower the price of calls to their networks from other networks (fixed or mobile). Lowering these charges would give competitors an advantage in the retail market as the lower wholesale cost element can theoretically mean that customers of the competitor would enjoy an overall cheaper service. Where customers enjoy a cheaper service, there is no cost incentive to switch operators. This implies that the effect of CPP regimes is to enable operators to price termination services above cost. Owing to the lack of substitutes and the CPP system, the Authority considers that there is no effective demand-side substitution for wholesale fixed and mobile termination services.

The Authority wishes to state unequivocally that the identification of the market conditions associated with CPP does not imply that the Authority intends to suggest the removal or replacement of this regime.

5.4. The Degree of Market Differentiation among Termination Services in the Market

While operators in the fixed and mobile markets operate separate networks and may utilise different technologies for providing termination services, there is little or no differentiation among termination services with respect to its utility for connectivity. However, under the current framework, all operators must provide termination services to all parties on a similar and non-discriminatory basis. This requirement can level the playing field where traffic proportions are equitable, and can be considered as a common constraint faced by all operators. Consequently, network operators providing termination services face similar competitive conditions in supplying termination services in relation to varying valid number ranges assigned to different network connections.

Despite little or no differentiation among termination services, these services are still not substitutable because only a terminating PSTN/PLMN operator can terminate calls to its subscribers' valid connections and it therefore has a monopoly for terminating traffic on its own network.

6. Conclusion of Market Analysis

The Authority has deployed a market review process consistent with industry practice that involves the identification and definition of the relevant market and an assessment of competition in the defined market, particularly whether the relevant market is effectively competitive. Based on its market review, the Authority has drawn the following conclusions:

6.1. Market Definition

Given the local framework, the geographic market for the provision of wholesale call termination services by the individual fixed and mobile network operators is national. The relevant markets are the wholesale markets for terminating fixed and mobile services and SMS on an operator's network.

The analysis of the product market reveals that, on the basis of a SSNIP, consumers will not respond to an increase in the price of termination rates as they will not be sufficiently aware of the price increase and, furthermore, would not deem the same price increase sufficiently material to react to at the retail level. This finding is also supported by the estimated inelastic cross price elasticity of demand between termination and retail services and the inelastic estimated point elasticities of demand derived from the local fixed and mobile telecommunications markets.

A further analysis of substitution in the product market reveals that fixed or mobile subscriptions and OTTs are not substitutes to wholesale call termination. Consequently, the Authority supports the finding that termination is a market on its own.

It is, therefore, determined that termination on each individual network constitutes a separate relevant market and is defined as follows:

a. a voice call terminated to a called party's valid number range associated with PSTN connections for which a termination charge is applicable
b. a voice call terminated to a called party's valid number range associated with PLMN connections for which a termination charge is applicable
c. an SMS terminated to a messaged party's valid number range associated with PLMN connections for which a termination charge is applicable

6.2. Market Competitive Analysis

The economic and technical characteristics of the fixed and mobile networks provide sufficient evidence to conclude that there is dominance in the provision of fixed and mobile termination services on a given operator's network. Termination markets in Trinidad and Tobago have the following characteristics:

i. One hundred percent (100%) market share ownership by the terminating network provider
ii. Lack of competition
iii. Lack of potential competition
iv. Lack of countervailing buyer power

These characteristics can allow for potential increases in termination rates above and beyond prevailing market rates. Based on the Authority's analysis, fixed and mobile operators' pricing of termination services is unconstrained by competition and therefore these operators are monopolists in each relevant termination market.

Table 5 presents a summary of the findings of the Authority's analysis.

Table 5: Summary of Findings of the Authority's Analysis

Parameter	**Factors/ Characteristics**	**Outcome**
1. Technology and Market Trends	Potential Competition (Barriers to Entry) • Technological network barrier	There is no technology that will perform substitution to terminating a call/SMS destined to a particular user on a particular operator's network via the traditional telephony network.
2. Market Share Analysis	• No effective substitutes	All fixed and mobile operators have 100% of calls and messages that require termination on their respective networks.
3. The Degree of Differentiation among Services	• Local framework mandates similar and non-discriminatory practices amongst all operators.	Despite little or no differentiation among termination services, these termination services are still not substitutable because only a terminating mobile network operator can terminate calls to its subscribers and it therefore has a monopoly for terminating traffic on its own network.

4. Power of the Provider to Set Prices	Countervailing Buyer Power • Buyers have no alternatives. • Buyers cannot produce the input. • CPP regime	A large operator or a group of operators wishing to terminate cannot impose competitive constraints on the termination rate charged by another operator. No other supplier can be a substitute for the provision of a call intended or identified for a particular network, to connect with a particular customer. Under the existing CPP regime in Trinidad and Tobago, there is no alternative to reaching numbers controlled by that provider (via traditional networks). There is no countervailing buying power as terminating buyers have no alternatives and also cannot produce termination services for other networks. Therefore, existing operators cannot impose competitive constraints on the termination rate charged by another operator. Due to the CPP regime, operators can profit from charging high termination rates.

In conclusion, in accordance with the Act, the Authority proposes to designate each operator as dominant (meaning the operator enjoys a degree of market power or position of economic strength in the provision of termination services affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers) in termination markets. This determination is based on an assessment of the criteria set out in section 29 (8) of the Act, and the relevant markets to be considered by the Authority for dominance are, therefore, the:

a. Fixed Termination

i. market for voice call termination on TSTT's (called party) valid number range associated with PSTN connections for which a termination charge is applicable.
ii. market for voice call termination on CCTL's (called party) valid number range associated with PSTN connections for which a termination charge is applicable.
iii. market for voice call termination on Digicel's (called party) valid number range associated with PSTN connections for which a termination charge is applicable.
iv. market for voice call termination on Prism's (called party) valid number range associated with PSTN connections for which a termination charge is applicable.
v. market for voice call termination on Lisa Communications' (called party) valid number range associated with PSTN connections for which a termination charge is applicable.

vi. market for voice call termination on Open Telecom’s (called party) valid number range associated with PSTN connections for which a termination charge is applicable.

b. Mobile Termination

i. market for voice call termination on Digicel’s (called party) valid number range associated with PLMN connections for which a termination charge is applicable.
ii. market for voice call termination on TSTT’s (called party) valid number range associated with PLMN connections for which a termination charge is applicable.
iii. market for termination of message (including SMS) on Digicel’s (called party) valid number range associated with PLMN connections for which a termination charge is applicable.
iv. market for the termination of messages (SMS) on TSTT’s (called party) valid number range associated with PLMN connections for which a termination charge is applicable.

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Appendix I - International Practices: Considering Dominance in Termination Markets

A sample of regulations in various jurisdictions was selected, which focused on the economic considerations and practical applications of dominance determination in termination markets. These regulators were selected using the following criteria:

i. Their policies must be publicly available.
ii. They must either operate at the regional level, that is, within the Caribbean (since regional operators are operating in relatively comparable economic circumstances to Trinidad and Tobago), or internationally, where they are recognised as having best practice.

The regulators included were:

i. Malta Communications Authority (MCA), Malta
ii. Office of Communications (Ofcom), United Kingdom (UK)
iii. Office of Utilities Regulations (OUR), Jamaica
iv. Telecommunications Regulatory Authority (TRA), Bahrain
v. Telecommunications Regulatory Commission (TRC), British Virgin Islands

The selected jurisdictions utilised a comprehensive and systematic approach to examining dominance in termination markets. Interconnection and termination wholesale markets were considered important by these jurisdictions, as they ultimately impact the competitiveness of downstream communications markets, ensuring maximum consumer benefits.

As an example, the TRC examined key telecommunications products and identified priority market clusters for review and assessment (Telecommunications Regulatory Commission (TRC) BVI 2010). Wholesale calls and SMS termination on the individual fixed and mobile networks were the first services to be reviewed. The TRC found it necessary and prudent to review these, since licensees with different shares and traffic flows may have different views on termination rates. In September 2011, the TRC made a formal determination[35] on dominance in the termination market for calls, *"declaring all operators dominant in the termination of calls to their own network"* (Telecommunications Regulatory Commission (TRC) BVI 2011).

[35] This formal determination is published at: http://www.trc.vg/images/attachments/Market%20Analysis/014_Report%20on%20Directive%20on%20Call%20Termination%20Rates.pdf

Subsequent to consultations with the relevant stakeholders[36], the TRC issued a licence amendment in August 2012 regarding dominant public suppliers, which states, "*Prices for telecommunications services shall be determined by providers in accordance with the principles of supply and demand in the market. ii) Should the Licensee be designated a supplier dominant in the market for call termination services in accordance with Section 26(4) of the Telecommunications Act, 2006 the Commission shall regulate the wholesale call termination rates payable to the Licensee by any other licensee or operator of telecommunications services interconnected to the Licensee's networks and shall impose such rates as outlined in Annex 8. iii) Annex 8 shall not apply to retail rates and prices chargeable by the Licensee.*"

The characteristics of termination markets in the jurisdictions reviewed are listed in Tables 6 and 7.

Table 6. Summary of Case Study: Defining the Relevant Market

Dimensions	Outcome
Product/Service Market: Demand-Side Substitutability Test	There are no effective demand-side substitutes for wholesale fixed and mobile termination services.
Supply-Side Substitution Test	There are no effective supply-side substitutes for wholesale fixed and mobile termination.
Geographic Market	The geographic dimension for the provision of wholesale call termination services by the individual fixed and mobile network operators is national.

Table 7. Summary Findings of the Sampled Jurisdictions

Parameter	Factors/Characteristics	Outcome
1. Market Share Analysis	• No effective substitutes	All fixed and mobile operators have 100% of calls and messages requiring termination on respective networks.
2. Potential Competition (Barriers to Entry)	• Technological network barrier	There is no existing technology that will perform substitution to terminating a call/SMS destined to a particular user on a particular operator's network via the traditional telephony network.

[36] Including Cable and Wireless (BVI) Ltd (LIME), Caribbean Cellular Telephone Ltd (CCT) and Digicel (BVI) Ltd (Digicel)

3. Countervailing Buyer Power	• Buyers have no alternatives. • Buyers cannot produce the input. • The CPP system	A large operator or a group of operators wishing to terminate cannot impose competitive constraints on the termination rate charged by another operator. No other supplier can be a substitute for the provision of a call intended or identified for a particular network, to connect with a particular customer. Due to the CPP regime, operators can profit from charging high termination rates. The called party is non-sensitive to the price of termination (and unaware of the existence of this wholesale service). In this sense, the incentives for an operator to keep termination rates at the competitive level are limited.

Based on the methodology employed by other regulators in the assessment of termination markets, the following conclusions were drawn:

i. The relevant markets are the wholesale markets for terminating fixed and mobile services and SMS on a given operator's network.

ii. The economic and technical characteristics of the fixed and mobile networks provide sufficient evidence to conclude that there is dominance in the provision of fixed and mobile termination services on a given operator's network. Given the parameters in Table 3 and the characteristics listed above, fixed and mobile operators' pricing of termination services is unconstrained by competition and, therefore, these operators are monopolists in each relevant termination market.

Appendix II – A Closer Look at Mobile and Fixed Retail Markets of Trinidad and Tobago, 2016

A. Number of Players

Table 8. gives an overview of current key providers of retail telecommunications and broadcasting services in Trinidad and Tobago.

Table 8. Domestic Telecommunications and Broadcasting Service Operators

Mobile Services	Fixed Voice	Fixed Broadband	Pay TV[37]	Leased Line
Digicel	Digicel	Digicel	Air Link Communications	Digicel
TSTT	Flow	Flow	Digicel	Flow
	Massy	greenDOT Limited	DirecTV	Massy
	TSTT	Massy	Flow	TSTT
		TSTT	greenDOT Limited	
			Massy	
			TSTT	

B. Domestic Mobile Short Messaging Service (SMS)

The number of domestic SMS in 2016 declined significantly by 35.1% compared to 2015. Total SMS sent decreased from 908.3 million in 2015 to 589.8 million in 2016. Of the 589.8 million SMS, 519.4 million were on-net[38] and 70.4 million were off-net[39]. Both on-net and off-net SMS decreased significantly by 37.1% and 15.5%, respectively. (Figure 2 illustrates.)

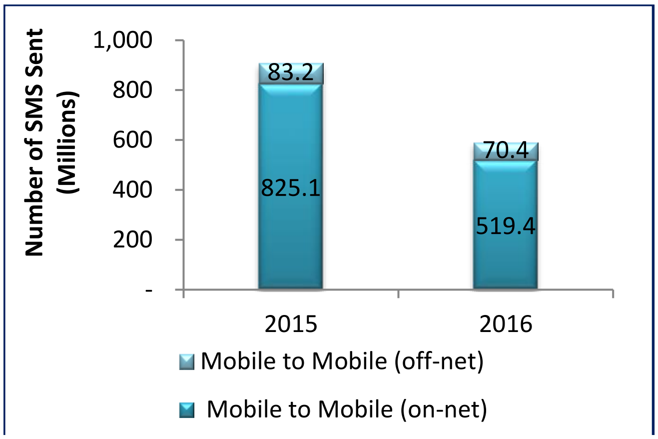


Figure 2. Number of On-Net and Off-Net SMS sent in 2016

C. Annual Domestic Fixed Voice Call Volumes

There were 370.8 million domestic fixed voice calls during the 2016 period, reflecting a 7.2% decrease compared to the 399.4 million calls recorded for 2015. Total on-net calls accounted for 214.0 million (42%) of total fixed voice calls, while total off-net calls accounted for 156.8 million calls (58%) of total fixed voice calls in 2016. Of the total number of fixed calls, fixed-to-fixed accounted for approximately 49% and mobile-to-fixed accounted for the remaining 51%.

[38] On-net fixed traffic refers to traffic originating on a service provider's fixed network and terminating on the same fixed network.

[39] Off-net fixed traffic refers to traffic originating on a service provider's fixed network and terminating on another network (intra and inter service provider). For example, a call originating on TSTT's fixed network and terminating on Flow, bmobile or Digicel's network will be included in these minutes.

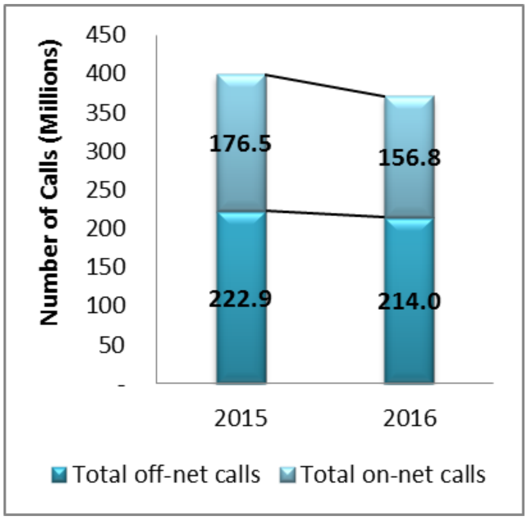


Figure 3. Comparison of Domestic Call Volume by Traffic 2015-2016

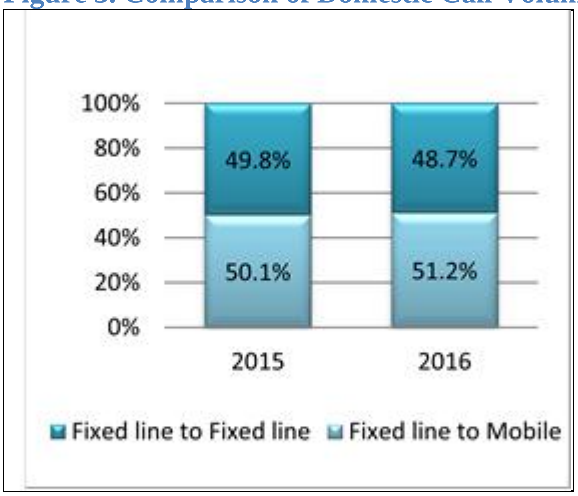


Figure 4. Comparison of Domestic Call Volume by Traffic Type 2015 – 2016

D. Annual Domestic Mobile Voice Call Volumes

In 2016, domestic mobile voice calls amounted to 3.1 billion — a reduction in the number of calls by 8.4% when compared with calls recorded for the previous year. On-net calls fell by 9% to record 2.3 billion calls in 2016. Off-net traffic recorded 790.1 million calls, accounting for a 6% decrease in calls.

Of the 790.1 million off-net traffic calls, approximately 162.0 million were mobile-to-fixed, which represented 5.3% of total domestic mobile calls. The remaining 628.1 million off-net traffic calls were mobile-to-mobile and accounted for 20.5% of total domestic mobile calls. While the number of domestic mobile calls for each subcategory decreased, there was no major change in the ratios compared to 2015. This indicates a fairly constant consumer call pattern in terms of the number of on-net and off-net calls during the review period. Table 9 compares 2015 – 2016 domestic mobile call volumes.

Table 9. Breakdown of Domestic Mobile Calls for 2015 – 2016

	2015	2016
On-net Mobile Voice Calls (billions)	**2.5**	**2.3**
Off-net Mobile Voice Calls (millions)	**846.5**	**790.1**
Off-net Mobile-to-Fixed Calls (millions)	175.2	162.0
Off-net Mobile-to-Mobile Calls (millions)	671.3	628.1
Total Domestic Mobile Voice Calls (billions)	**3.4**	**3.1**

E. Annual Domestic Fixed Voice Traffic in Minutes

There were 1.1 billion fixed voice traffic minutes in 2016; on-net and off-net minutes accounted for 662.7 million and 471.4 million, respectively. Fixed-to-fixed minutes transferred on different networks (off-net) recorded 61.2 million minutes and fixed-to-mobile minutes amounted to 410.2 million minutes during 2016. The number of fixed voice minutes by traffic type is given in Figure 5.

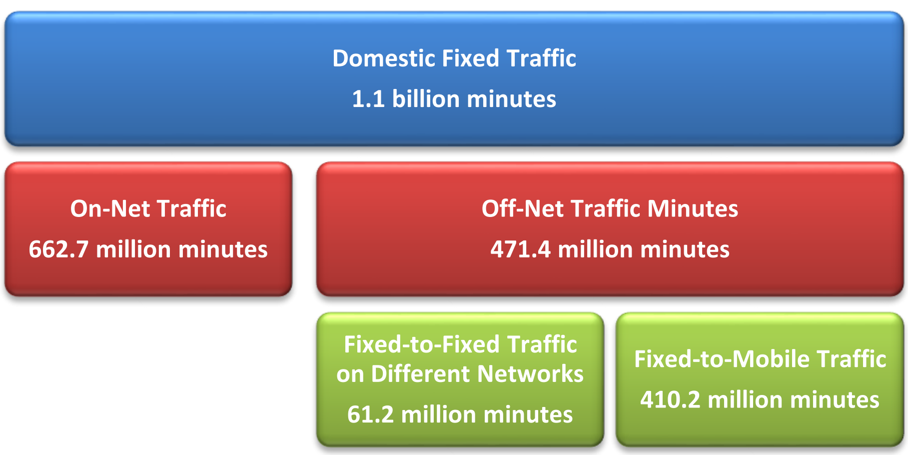
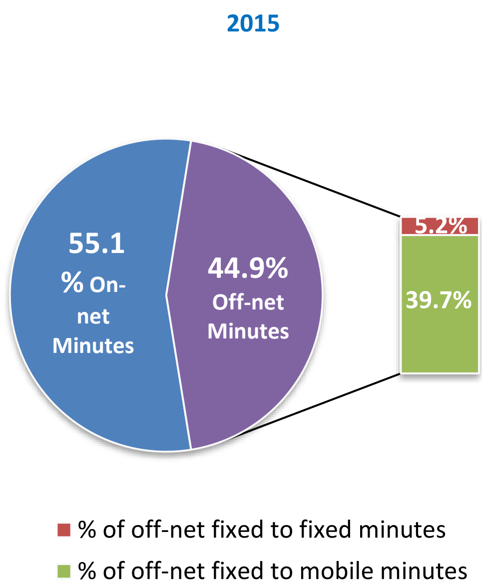


Figure 5. Breakdown of Fixed Domestic Traffic Minutes 2016

Consumption patterns for fixed voice minutes remained relatively stable in 2016 compared to 2015. On-net traffic minutes contributed 58.5% to total minutes in the fixed voice market, increasing by 3.4% from 2015. Total off-net traffic contributed 41.5%, of which the majority comprised off-net, fixed-to-mobile minutes (36.1%), and the minority comprised off-net fixed-to-fixed minutes (5.4%). This percentage breakdown of minutes by traffic type over the last two years is shown in Figure 6.



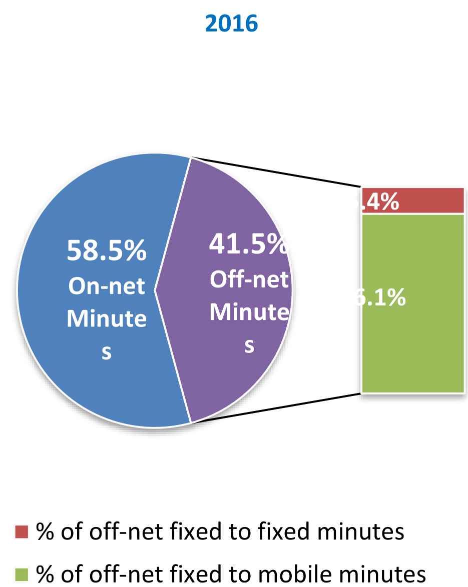


Figure 6. Total Domestic Fixed Traffic Minutes by Traffic Type 2015 and 2016

F. Annual Domestic Mobile Voice Traffic in Minutes

Of the 3.7 billion minutes of domestic mobile traffic recorded for 2016, on-net[40] traffic totalled 2.9 billion minutes while off-net[41] traffic recorded 801.1 million minutes. Off-net mobile-to-mobile minutes totalled 548.2 million, while off-net mobile-to-fixed minutes totalled 252.9 million minutes.

When compared to 2015, total domestic traffic (on-net and off-net minutes) decreased by 5.8%, or 228.0 million minutes. It was also observed that on-net traffic minutes decreased by 7.1% (221.3 million minutes), while off-net traffic increased minimally by 0.3% (6.6 million minutes). Figure 7 illustrates the breakdown of domestic mobile traffic minutes for 2016 and Table 10 compares 2015 to 2016 domestic mobile traffic in minutes.

[40] On-net mobile traffic refers to traffic originating on a service provider's mobile network and terminating on the same mobile network.
[41] Off-net mobile traffic refers to traffic originating on a service provider's mobile network and terminating on another network (intra and inter service provider). For example, a call originating on Digicel's network and terminating on bmobile, Flow or TSTT's fixed network will be included in these minutes.

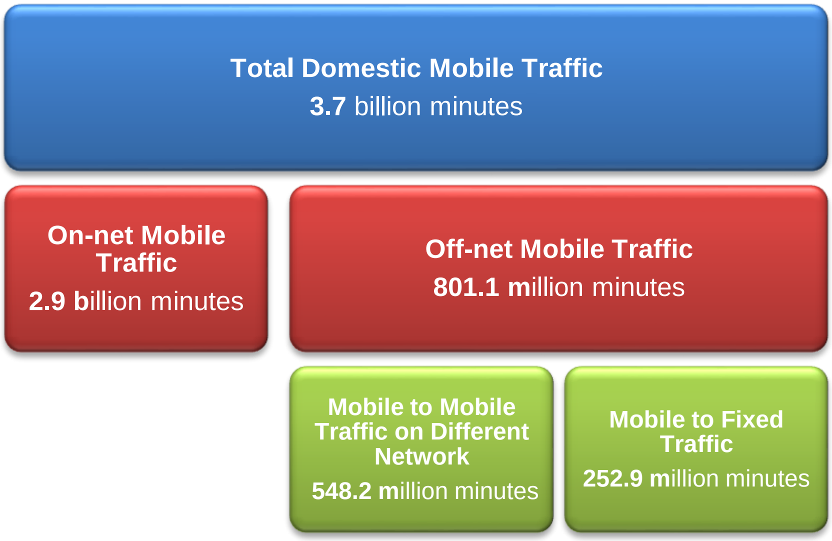


Figure 7. Breakdown of Domestic Mobile Traffic Minutes 2016

Table 10. Breakdown of Domestic Mobile Minutes for 2015 – 2016

	2015	2016
On-net Mobile Traffic (Billions)	**3.1**	**2.9**
Off-net Mobile Traffic (Millions)	**807.7**	**801.1**
Mobile-to-Mobile Traffic on Different Networks (Millions)	546.4	548.2
Mobile-to-Fixed Traffic (Millions)	261.2	252.9
Total Domestic Mobile Traffic (Billions)	**3.9**	**3.7**

The percentage of total domestic mobile voice minutes terminating on a domestic mobile network continued to account for the majority of mobile minutes, comprising 93.1%. The number of domestic mobile minutes terminating on a domestic fixed network represented 6.9% in 2016.

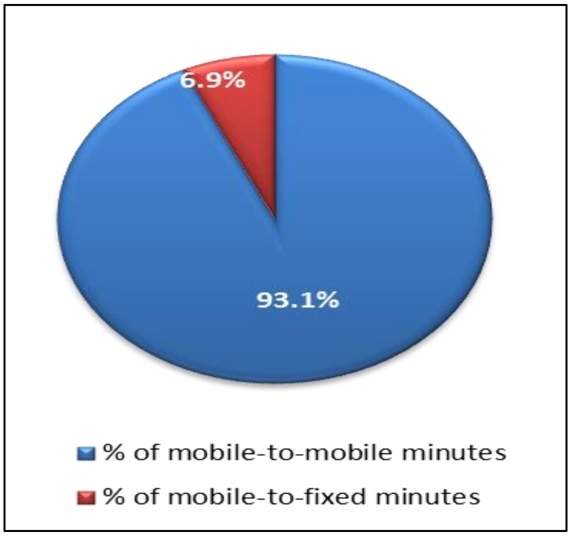


Figure 8. Percentage of Mobile-to-Mobile and Mobile-to-Fixed Minutes 2016

G. Subscriptions and Revenues

Fixed Voice Market

Subsequent to the decrease in 2015, the number of subscriptions in the fixed voice market increased minimally in 2016. Subscriptions to fixed voice services stood at 271,900 at the end of 2016 — an increase of 2,100, or 0.8%, when compared to 2015.

Gross revenues received from fixed voice subscriptions for 2016 amounted to TT$714.6 million — a decrease of approximately TT$25.8 million, or 3.5%, from the previous year. It was observed that the decrease in fixed voice subscription revenues was steeper in 2016, in relation to the 0.9% and 0.8% reduction observed in 2014 and 2015, respectively.

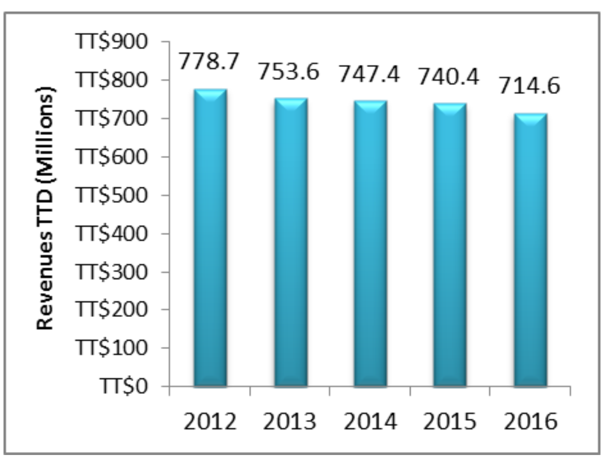


Figure 9. Fixed Voice Subscription Revenues 2012 – 2016

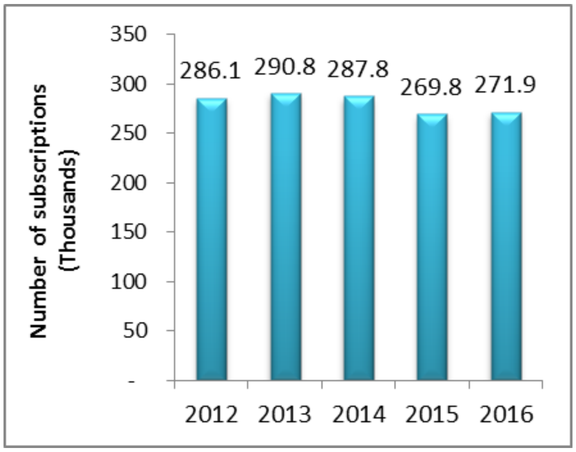


Figure 10. Fixed Voice Subscriptions 2012 – 2016

Mobile Market

Subsequent to the relatively sharp increase of 7.2% in 2015, mobile voice subscriptions increased moderately by 2.0%, recording 2.17 million subscriptions in 2016. Total revenues from mobile voice services amounted to TT$1,890 million in 2016 — the lowest recorded in the past five years and representing a 5.1% decrease over the previous year.

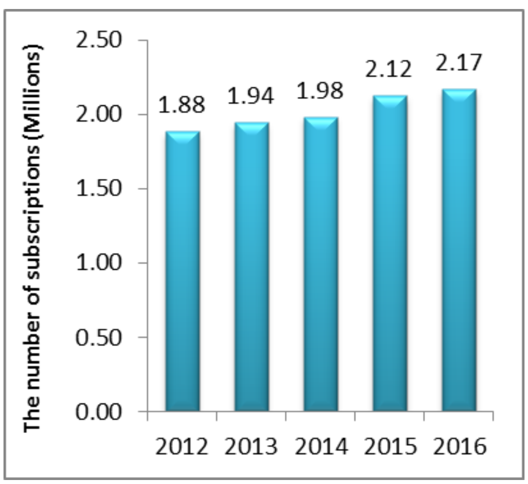


Figure 11. Number of Mobile Ssubscriptions 2012 – 2016

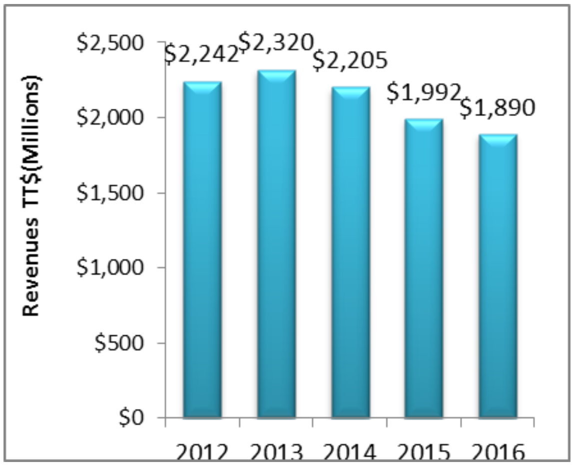


Figure 12. Annual Revenues from Mobile Voice Services 2012 – 2016

H. Penetration and HHI

Fixed Voice Market

With 271,900 subscriptions for a population of approximately 1.4 million, the fixed line penetration rate in Trinidad and Tobago was approximately 20.3 as at December 2016. This implies that, in 2016, there were approximately 20 fixed voice subscriptions for every 100 persons in Trinidad and Tobago.

Out of every 100 households in Trinidad and Tobago, approximately 54 households had access to fixed voice services for the year 2016. When compared to the previous year, fixed line household penetration increased marginally by 2%.

The level of concentration[42] in the fixed voice market over the review period (2012 – 2016) has been consistently declining. HHI recorded 7,573.3 at the end of 2016, which was a decreased 8% compared to the same period in the previous year.

[42] The measure of concentration of firms within a particular market was calculated using the Hirschman-Herfindahl Index (HHI). It is computed as the sum of squares of the market share of all firms within a particular market and ranges from approximately 0 to 10,000.

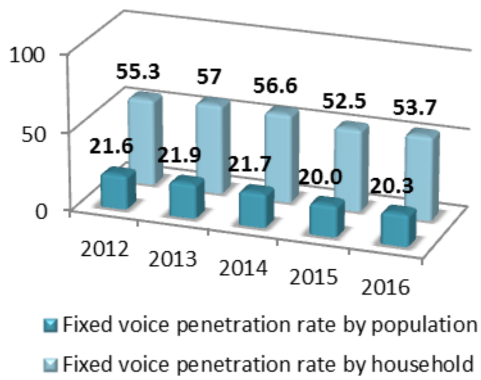


Figure 13. Fixed Voice Penetration Rates 2012 – 2016

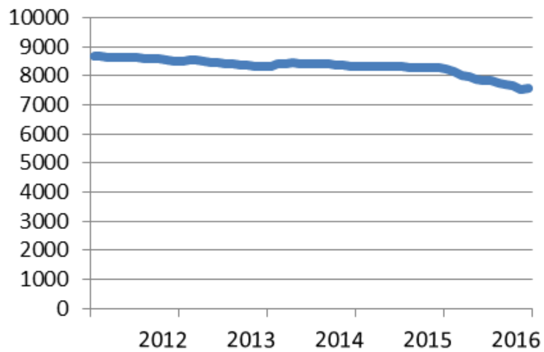


Figure 14. HHI for the Fixed Voice Market 2012 – 2016

Mobile Voice Market

The increase in mobile subscriptions observed in 2016 contributed to a rise in the mobile penetration rate[43]. The rate stood at 160.0 as at December 2016, representing an approximate increase of 1.7% over 2015. This implies that there were 160 mobile subscriptions per 100 inhabitants in Trinidad and Tobago as at the end of 2016.

[43]Mobile penetration is calculated as (number of mobile subscriptions / total population *100). Total population used is from the Central Statistical Office's midyear population estimate.

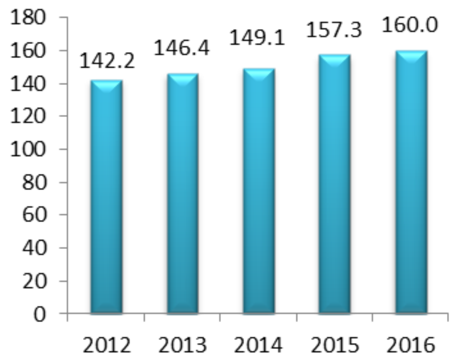


Figure 15. Mobile Penetration Rates per 100 Inhabitants 2012 – 2016

Comparing the last five years, Figure 16 shows that the HHI has been relatively stable, with roughly 5000 points over the period. During 2016, minimal changes in the HHI were observed. The level of concentration in the mobile voice market decreased in the second quarter from 5,122 to 5,101, increasing in the third quarter to 5,107 and decreasing again in the fourth quarter to record 5,104.

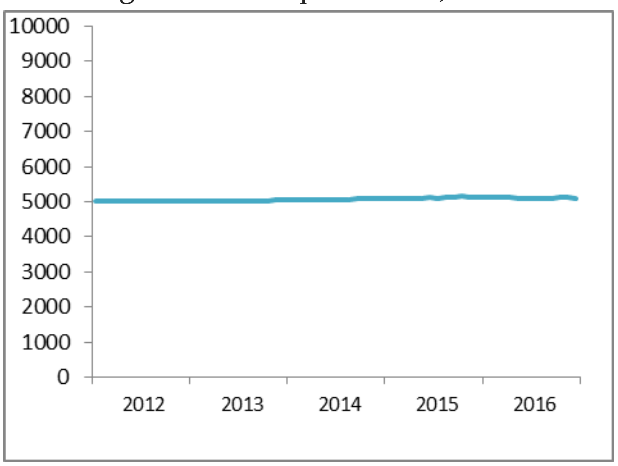


Figure 16. HHI for the Mobile Voice Market 2012 – 2016

I. Domestic Retail Calling Rates

Tables 11 - 14 show retail fixed and mobile rates as at November 2016.

Table 11. bmobile Prepaid Mobile Calling Rates 2016

Calls from bmobile	Any-time local calling rates
To Bmobile	**$1.24**
To Digicel	**$1.24**
To fixed lines (Flow, TSTT)	**$1.24**

Table 12. Digicel Prepaid Mobile Calling Rates 2016

Calls from Digicel	Any-time local calling rates
To Digicel	**$1.29**
To bmobile	**$1.29**
To fixed lines (Flow, TSTT)	**$1.29**

Table 13. Mobile Prepaid SMS Rates 2016

Prepaid Text Message (SMS)	To Digicel	To bmobile	To international mobile
From Digicel	**$0.37**	**$0.55**	**$0.68**
From Bmobile	**$0.56**	**$0.34**	**$0.68**

Table 14. Mobile Pay-as-You-Go Data Rates 2016

Pay-as-you-go Data	
Digicel	**$2.25/MB**
bmobile	**$2.25/MB**