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Price-cuts for the Mobile Voice Calls and the Tit-For-Tat Game on the Tunisian Telecommunication Market

Tunus Telekomünikasyon Piyasasında Mobil Sesli Aramalar ve Tit-For-Tat Oyunu için Fiyat İndirimleri

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MAKALE BİLGİSİ	ÖZ
	Tunus telekomünikasyon pazarında, 2011-2015 dönemleri arasında mobil telefonlar arası sesli aramalarda yoğun fiyat indirimleri yaşanmıştır. Üç büyük tedarikçi olan Tunisie Télécom, Ooredoo and Orange'un Tit-For-Tat oyununda yoğun fiyat indirimi yaptıklarını veya gelirleri azalsa da aşırı tepki verdiklerini görüyoruz. Bu çalışma, ekonomik literatürde açıklandığı gibi, fiyat dinamiklerinin pazar payı kazanmak için basit bir strateji mi yoksa bir "fiyat savaşı" mı olduğunu araştırmaktadır. Bu çalışmada, fiyat esnekliğine, kullanıcı başına ortalama gelire ve fiyat serilerine göre her sağlayıcı için talep eğrileri oluşturulmakta ve ardından gecikmeleri analiz edilmektedir. Saf fiyatlandırma stratejisi, veri trafiğinin hızlı büyümesi ve kişi başı harcanabilir gayri safi milli hasılanın azalması bağlamında tartışılmaktadır.
ARTICLE INFO	ABSTRACT
	The Tunisian telecommunication market experienced intense price-cuts of the mobile-to-mobile voice phone services throughout the 2011-2015 period. This paper shows that the three major providers, *Tunisie Télécom, Ooredoo* and *Orange*, have replicated the price-cuts as in the Tit-For-Tat game or over-reacted despite the hurt of their revenues. This paper investigates whether price dynamics is a simple strategy for gaining market share or a "price war", as described in the economic literature. This paper constructs the demand curves for each provider based on price-elasticity, average revenue per user and price series, and then we analyze their lags. The pure pricing strategy is discussed as it coincided with the fast growth of data traffics and the decrease of the gross national disposable income per capita.

1. Introduction

A competitive market, the contemporary norm to supply the best product or service at the lowest price to end-user consumers, constitutes the aim of competition policies and regulations. However, converting an imperfect market toward such a functioning process whether it has a purely monopolistic or an oligopolistic structure is not subordinated to a standardized road map. The characters of imperfect market like the mobile phone services sector depend on several variables, obviously the number of rivals, the price-elasticity but also the degree of the increasing returns to scale or the trends of the long run costs, the

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bundling strategies, etc. In its pioneering formulation of the firms' competition, Cournot (1838) had studied two rivals' action-reaction supply in a simple duopoly market, while Bertrand (1883) had resumed such a market based on a price-cut mechanism. Assuming identical costs of production and infinite demand elasticity, its model leads to an equilibrium where both firms have zero profit, offering to consumers superior quantities to the monopoly case and at a lower price. Modifying this competing on price duopoly, Edgeworth (1889) introduced production capacity restraints. A paradox appears: the two competitors cannot attain any state of equilibrium when they run the price strategy. If too many uncertainties arise when the market is only shared by two companies, what it would be for a greater number of companies, one would ask. The "oligopoly problem" is posed. Thus, "Edgeworth thought that the oligopoly problem was essentially indeterminate and that price would never reach an equilibrium position in markets characterized by fewness in number, as opposed to what happens in competitive markets" (Vives, 1999: 4). The "fewness in number" indicates that rivals could pursue uncountable competitive behaviors, although the functioning modes are bounded by two extreme statuses: i. e. an unstable pure price strategy and the collusive equilibrium. That is, for Chamberlin (1929), collusion is reachable when a still reduced "small group" of rivals operates in the oligopolistic market. Partners should then act secretly -inasmuch as the collusion is an unlawful practice- to maximize joint profits. However, the collusive solution, although agreed by all conspiracy operators appears highly unstable due to the volatility of the supply self-discipline. Thus, defectors cheating on the cartel agreement, granting unadvertised discounts, or practicing secret price cutting, will face retaliation strategies. In the precise case of the "perfect collusion", Stigler (1964: 48) states that "no buyer changes sellers voluntarily. There is no competitive price-cutting if there are no shifts of buyers among sellers". In a nutshell, when substantial consented rebates by the transgressor of collusion are revealed, its competitors unleash a series of price-cut reactions that can be otherwise qualified. Indeed, in such a case, "price wars represent one of the most severe (and unique) forms of competitive pricing interplay, causing great losses in terms of margins, consumer equity and ability to innovate" (Heil and Helsen, 2001: 83).

In this paper, this study investigates mainly the Tit-For-Tat strategy (Rapoport and Chammah, 1965; Axelrod, 1980) of competitors replying to rivals' price discounts in the Tunisian market of mobile-to-mobile phone call services, recognized as a sector having highly transparent prices, without any possible tacit agreements with consumers. In section I, an overview of the Tunisian telecom market competition is presented in conjunction of the price-cutting practiced by the major phone networks. In section II, this study investigates whether the telecom service price-cuts unleashed by the providers especially in the period 2014-2015 had been a plain price-cost adjustment in a more competitive market or signaled a blatant breach of a (tacit)

collusive equilibrium. Thus, this study wonders to what extent to which the per minute price for mobile-to-mobile calls that was divided by ten in just about some months, reflects the outcome of a "price war" as considered in the economic literature (Slade, 1990; Levenstein, 1997; Rao and al., 2000; Van Heerde and al., 2008; Krämer and al., 2016), and focusing especially the typology of Bungert (2003). In Section III, the demand curves, specific to each Tunisian mobile operator, are estimated to assess the results of concatenation of facts, regulation and turn of macroeconomic events. Final remarks summarize the consequences of the pure price strategy in the voice phone services with its most likely winners and/or losers in conjunction with the fast-growing mobile data traffic.

2. From A Presumed Collusive Duopoly to a Competitive Oligopoly

The global wave of the telecom markets' liberalization reached Tunisia in the early 2000 depriving the incumbent Tunisie Télécom (TT) a State-owned enterprise (SOE), from its mobile phone monopoly albeit it has preserved temporarily its exclusive concession on the fixed phone network. Twenty years later, three major operators, TT, Ooredoo and Orange seem competing on services quality far from the pure price strategy. Such an outcome is the result of a circumstantial competitive process which deserves to be analyzed insofar as it followed a non-intuitive path.

After a short overview of the main features and the key facts of the Tunisian telecommunication market, the nature of the competition between mobile phone providers is investigated.

2.1. A Suspected Collusive Duopoly with Stable Prices

TT launched in 1998, the mobile phone services as a monopolistic provider. Four years later, the market mutated to a duopoly with the license granted to the privately-held corporation *Tunisiana* (rebranded Ooredoo in 2014 and held by a Qatari company).

For almost a decade, TT and *Tunisiana* conserved quasi-identical mobile-to-mobile phone call prices around TND 0.225. The basic offers grant rebates for postpaid subscriptions, on-net traffics, communications' off-peak and beyond a certain volume thresholds of minute calls, time slots, etc., that are different for private or corporate customers. In addition, the promotional offers introduced (basic, options, loyalty programs and duration of bonuses) may be withdrawn without notice.

To this end, TT and *Tunisiana* have offered respectively 13 and 14 types of subscriptions to consumers, with 16, 20 and 23 categories of "entry" to adjust their choice, which obviously modifies the nominal tariffs (Leaders.com.tn, 2010). Besides, advertisements spreading evasive pieces of information without pertinent details on hidden service prices (migration cost and delay, minima of consumption,

billing level, etc.) prevented the consumer's rational choice. The complex nature of this information has led Tunisian consumers to set up satisfactory routines for their mobile telephony instead of perfect optimization of minimum costs, therefore in relative autonomy in relation to prices (Rebaï and Flacher, 2013). This phenomenon has been described by Lambrecht and Skiera (2006) as "paying too much and being happy about it".

Moreover, knowing that the elasticity of demand seemed to remain less than unity, TT and *Tunisiana* have not reduced their baseline tariffs even two years after the entry in 2010 of Orange, the third mobile operator.

They were undoubtedly charging retail prices well in excess of those generally necessary to recover fixed and variable costs. While the price cap regulation is recommended in the early stages of competition, from its inception, the Instance Nationale des Télécommunications de Tunisie (INTT) did not implement such a regime to prevent the exploitation of the market power by the duopoly. It should be recalled that Oftel the famed UK regulator stated that "price controls may be appropriate if there is insufficient competition to provide a competitive constraint on prices" (Oftel, 2001:1). Tunisian regulatory body chooses to regulate only the wholesale

mobile-to-mobile termination rate (MMTR) paid by an operator when the call of its subscriber terminates in a rival network (see Bouali, 2017).

2.2. A Conflicting Oligopoly with Retaliate Price-Cuts

The current oligopolistic structure of the mobile phone market was already reached since May 2010 with the entry of Orange, offering the 3G technology. Even if the Tunisian State holds 51% of the company's share capital, it consents that the nomination of Orange Tunisia's CEO remains a privilege for France Telecom/Orange, holding the other part of the capital.

Presently, these three major providers offer 2G, 3G and 4G technologies and share more than 98% of the telecommunication market. Lycamobile, a virtual mobile network operator (VMNO), launched in 2015 and established in the market niche of international call traffics detains the residual proportion (fig. 1). A noticeable transformation of the market occurred, from a duopoly upon an oligopoly structure.

Fig. 1. Tunisian mobile telephony market share in 2009, 2014 and 2020 (subscriptions)
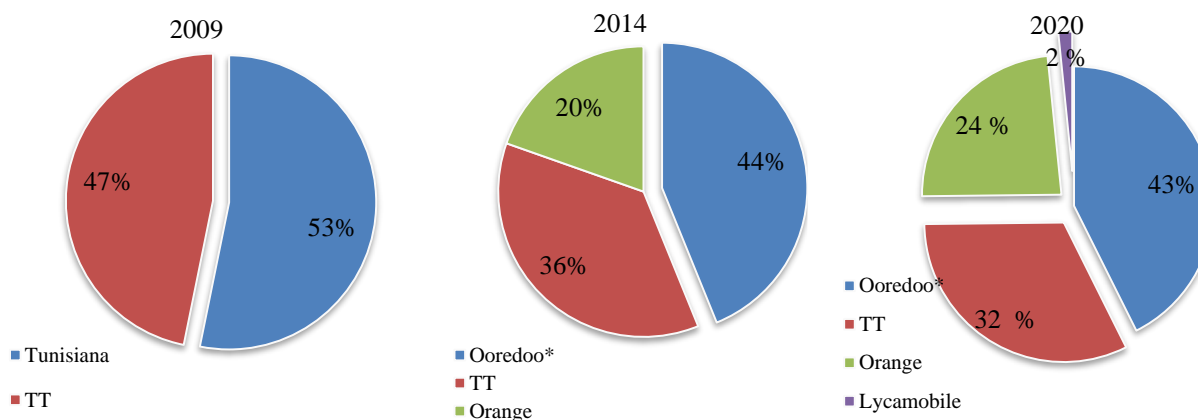
Source: INTT (2010: 83; 2014: 62; 2020a: 3).
 *previously Tunisiana

The prepaid subscriptions have prevailed significantly and continuously since the start of the mobile phone market with currently almost 90% of the 14.6 million active SIM cards (INTT, 2020b: 15). This volume of subscriptions suggests that consumers subscribe to multiple offers from different providers to enjoy advantageous tariffs inasmuch as the Tunisian population did not exceed 12 million. Hence, the present paper focuses on the operators' competition on the mobile-to-mobile voice phone services, and is bounded to the prepaid subscriptions.

3. Characterizing Price-Cuts: Market Adjustments vs. "Price War"

Microeconomics stipulates that the price in a competitive market converges to the production cost but does not mention any precise dynamic path leading to such a long-term state. In brief, unspecified by the economic theory, the transition from a high to a low price could follow a smooth or a disrupted evolution to attain the corresponding adjusted price.

Thus, in absence of technological or demand shocks, the price-cut can be the cue of an aggressive strategy. That is, this study wonders how the price range of mobile to mobile

voice call per minute went from TND [0.190, 0.225] in 2010 to [0.031, 0.038] in 2016.

3.1. Price Strategies

Reporting exhaustively the aggressive price strategies that could reward its initiator, Nagle and Müller (2018: 170-171) identified four cases.

The authors selected to the first rank prices' lowering and producing faster than competitors to induce an "experience effect" on industrial series. The firm implements a low-cost business model and thus a competitive advantage. Albeit observed only in a few high-technology markets, the authors expressed their skepticism on its relevance in other markets.

The second case of the success of a price-cut strategy consists in a firm controlling previously a niche market too small to threaten competitors. It achieves a scale-up of its operations enabling it to be sufficiently cost-competitive to expand in other market segments.

The third case seems to be an extension of the previous strategy. The firm subsidizes losses in one market where it cuts prices by the profits obtained from its complementary products in others markets. A remarkable discount intended only for an item whose consumption is inseparable to the set of its other products.

The authors conclude with the optimistic case of a company that cuts prices in an already mature market and where margins are already low. In such a case, the firm's executives prospect a new and positive trend of the market profitability "assuming that they have insight that their competitors lack" (Nagle and Müller, idem, 2018: 171).

3.2. Price-Cuts Mutate into a Price War Phases

In practice and to identify concretely how price war dynamics occur, a period stage phasing involving the competitors was proposed by Bungert (2003, idem).

To this end, the author reports in one glance the five phases prevailing in most price wars and the firms' grounds to pursue the price-cuts' escalation (Table 1).

The phase I, labeled ex-ante status quo, defines apparently a tacit collusion where the dispersion of price levels is restrained in an accepted range and recognized legitimate in 'established' boundaries. If price fluctuation occurs inside such an interval, rationales to reactions are not found, but possible "early warning signals" (EWS) appear. The market is still at the threshold of the "price war" ignition.

In phase II, a substantial price-cut threatens the rivals' interests in an increasing manner. Competitors follow suit, and an iterated sequence of price cuttings is observed.

Under the pressure of the "price cutting momentum" (Urbany and Dickson, 1991: 394), the mimetic behavior to decrease prices is shared by competitors. A step identified in the Tit-For-Tat strategy (Axelrod, 1980, idem) as a replicated behavior. Thus, "as the name implies, a tit-for-tat strategy is one which apes the other player: one plays whatever the other played the last time" (Rapoport and Chammah, 1965: 207, idem).

The price war is launched according to Busse (2000: 2) insofar as "a price war is a period in which the firms choose prices that are significantly below the prices charged in the industry". This phase II signals a noticeable transitory (quasi-)equilibrium inasmuch the over-reacting behavior rises the risk to drive price below-cost, i.e., under the Bertrand-Nash equilibrium.

When the market records the lowest prices ever practiced a step further towards this direction is taken. The phase III is initiated. "It seems that this phase can only be terminated when all firms return to a higher price level simultaneously or in rapid succession... the duration of price wars depends on whether (and how fast) firms can find ways to coordinate higher price charges" (Bungert, 2003: 24, idem).

In phase IV, market recovers a price level certainly above cost when rivals see that their struggle conveyed only scarce benefits and exhausted their financial accounts.

Eventually, the stabilization of the price, albeit at a level substantially below that of the initial phase, leads to the post-war stage, named phase V.

Table 1. Price War Phases

Phase	I	II	III	IV	V
Label	Status Quo (ante)	Escalation Phase	War Phase (Stagnation)	Termination Phase	Status Quo (Post-war)
Character	Pre-war phase (evtl. EWS)	Phase of price cuts, escalation	Low-price phase. Price war in the narrow sense	Phase of rising price, de-escalation	Post-war phase
	Equilibrium (tacit) collusion	Dis-equilibrium	Non-stable equilibrium (Bertrand-Nash or below)	Dis-equilibrium	Equilibrium (tacit) collusion
Price	P_{cb}	$P_{cb} > p^* > P_w$	P_w	$P_w < p^* < P_{cb}$	P_{ca} ($< P_{cb}$)

Source: Bungert (2003: 22)

p^* : price charged by single firms, P: price, Pcb: price, collusive before (price war), Pca: price, collusive after, Pw: price, war phase, and EWS : Early Warning Signals.

A price war could follow a sequence of typical stages with escalating reactions of the involved firms. It leads eventually to a lower price than its ex-ante level.

3.3. The Price motions in 2014-2015

The voice phone call price motion in the Tunisian telecommunication market in the years 2014, and 2015 will be qualitatively appreciated with the price war prism introduced by Bungert (2003) and summarized in Table 1.

3.3.1. Rivals' lagged reaction times on price-cuts

Market entry of a competitor could triggers competition as reported in literature (Elzinga and Mills, 1999). Thus, Orange that entered the market at mid-2010 has initiated a slight cut of the duopoly standard price, i.e., from TND 0.225 to 0.190, in order to gain market share in the voice phone services. Such a limited price difference at once attracted subscribers and strategically contained its rivals into the no-reaction domain. The price-cut remained apparently in the 'established boundaries' defining a peaceful competitor, and canceling aggressive reactions (Kalra and al., 1998).

Thus, Ooredoo and TT have certainly considered that their (low) on-net tariffs -for calls over a same network-, known as the "club effect", offset the rebate by Orange, without significant churn and migration of their subscribers to Orange.

Indeed, even licensed with the 3G technology, Orange entered the market with a disadvantage against its rivals. Thus, it has no installed 2G customer base to fund its expansion into 3G whilst TT and Ooredoo, forming the previous duopoly, earned massive revenues from their networks with the mature GSM technology. Note that Orange should expect acceleration in sales of bundled offers enabled by 3G technology.

However, attracting and retaining subscribers through very interesting packages (cheap subscription + handset subsidies), bundling voice calls with large numbers of SMS texting and MMS pictures and social networks access resulted as a risky strategy for Orange. Indeed, in this period, its network did not cover all the Tunisian territory for several months. In 2012, its indoor 3G coverage failure rate reached 74% (INTT, 2012a:9). As a consequence, it cannot spread its marginal cost over a large volume of services as its 2G rivals to achieve significant economies of scale.

Unsurprisingly, at end-2012 Orange showed some signs of the failure of its strategy insofar as its market share remained locked at 12 %.

This emerging oligopolistic structure balancing two antagonistic forces, the previous duopoly, and a new entrant introducing the 3G technology deserves to be qualified a status quo, as proposed in the Table 1 typology. In the figure 2 recording the price levels by major operator from 2010 to 2016, this study designates such a phase I as a status quo albeit split in two time periods, I(a) and I(b).

Fig. 2. Price Dynamics of the Mobile Voice Phone Services of the Three Leading Tunisian Telecommunication Providers over the Period 2010-2016.
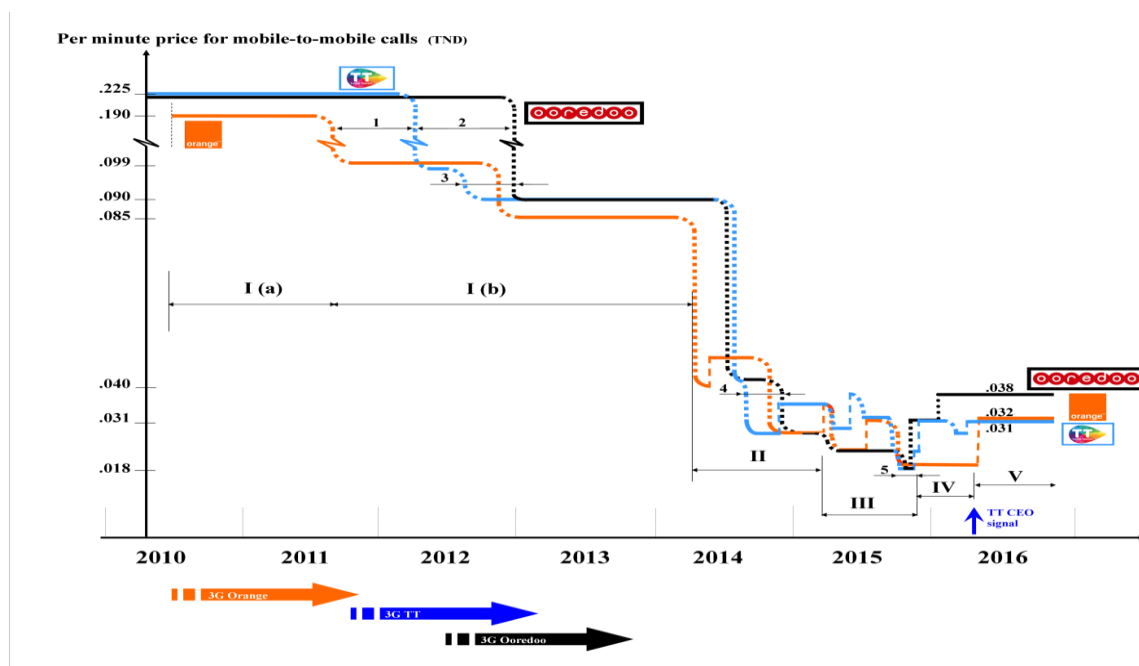
Source: Providers' sites and various media releases
I(a), I(b), II, III, IV and V indicate the price war phasing. The tiny segments illustrate the reaction times to price drops. The colored arrows (below the year axis) indicate the 3G license dates for Orange, TT and Ooredoo.

The first span I(a) signaled the 'peaceful' Orange entry while the second one I(b) has implied rival price-cut reactions through a mimetic behavior but without price-cuts escalation.

Indeed, even if I(b) indicated an unexpected Orange phone voice call price-cut by almost a half inducing twice TT reaction, followed by an Ooredoo recovery, it reveals relatively long reaction times marked in the figure 2 by the segments 1, 2 and 3.

The stabilized prices over more than two years in this stretched I(b) period may be explained by the TT and Ooredoo refusal to implement the number portability as requested in 2012 by the regulatory body (INTT, 2012b) [1]. It has presumably preserved their subscriber bases and damped their churn rate. Thus, rivals would not launch retaliatory measures against an operator offering the lowest price when they consider that their customers are 'captured' to their own networks. Unleashing price-cut reaction did not have any rationale as long as such captures remain robust, i.e. in case of significantly null substitution elasticity. In the final analysis of this phase I, the whole tensions could be appreciated as early warning signals of price-cuts' reprisals. It is to highlight that the Orange maintained the status quo inasmuch it always alluded that its promotional offers were launched in limited editions so as not to shove rivals to launch aggressive counter-propositions.

While the situation in early 2014 appeared stable, Orange decided (again) to cut by half the voice phone call price and to rollout a novel price strategy.

It can be argued that, competing with its licensed competitors also for 3G services, Orange was not satisfied with its market share, which did not even exceed 20%.

3.3.2. The tit-for-tat game outcomes

Orange's cost advantage is a persuasive ground to trigger such aggressive price-cut against the incumbent TT, which supports the heavy maintenance costs of its fixed network and the plethora of the staff employed [2]. Even if it is recognized that TT enjoys the comfortable status of an SOE benefiting from institutional and financial support of the Tunisian State, it could suffer, however, if price drops proceed for too long. Besides, rationales to cut prices are strong in the telecom industry insofar as it has generally a strictly decreasing long run average incremental cost (LRAIC).

Gaining market share over the long term could be possible for a company with cost primacy as economic scholars predict. Indeed, "if a company's variable cost position is much better than that of its competitors, it can gain market share by reducing prices. Competitors will not be able to keep up over the long term, and the increase in volume for the cost leader can be profitable" (Duranton and Izaret, 2009:1).

Actually, a pure price strategy to gain market share is in itself disputable, even more when the firm cannot differentiate its adversaries. In other words, Orange has initiated aggressive conduct against TT which has inefficient cost control, but it also attacked Ooredoo, the leader, a purely mobile network provider recognized as having efficient an efficient cost-management. The outcome of the price cuts triggered on this second front will inevitably be uncertain.

Indeed, "a wrong guess about rivals' reactions would throw the whole calculation off and necessitate readjustments which in turn would provoke further moves by rivals, and so on, the whole process quite possibly degenerating into mutually destructive price warfare" (Baran and Sweezy, 1966: 58).

That is, Ooredoo and TT cannot further circumvent Orange's challenge insofar as grounds of the 'no-reaction' vanish. Avoidance of confrontation could be costly because the passivity will not undo Orange's direct threat to their 45 and 35 % market shares, respectively.

Ooredoo reacted with a very heavy price cut to defeat Orange's strategy even if the latter readjusted its price level by a slight rise, then TT ignited an action-reaction sequence of closer price drops. As shown also in the figure 2, the segment 4 that marks the reacting time becomes shortened in the phase II underlining the downfall price spiraling.

An illustration of the outcome of the Tit-For-Tat game could be stated as follows: "when one company lowers prices, its rivals will invariably do the same, potentially nullifying any benefit in sales that the price decrease was expected to bring" (Bertini, 2014: 55).

In the phase III, the hit back against rivals becomes the main competition mechanism leading, in fine, to the Bertrand paradox: market equilibrium and an output without any profit for all competitors, i.e., the price equals the average cost. Indeed, in the final stage of this phase III, signalized by the interval 5 in the figure 2, Ooredoo's per-minute price of the prepaid voice call fell to TND .018 approaching the regulated MMTR, and fixed by the INTT at TND 0.015.

Ooredoo, the market leader drives the retail price to low levels, and seemingly very close to the inner cost of a communication in a same network. This Nash equilibrium seems to mark this phase designating the Bertrand paradox of "few" companies supplying with no benefits. In a nutshell, if this phase of revenue shortfalls is pursued for too long, deeper hazards as financial distresses would appear especially for TT.

In July 2015, the TT CEO, S. Jarraya, resigned less than a year after his appointment to this post in September 2014. Consequently, the price-cut momentum as the behavioral side to the competition strategy reached its limits.

Apparently, it does no longer inspire the pricing executives of the major telecom operators when they have realized that revenues become effectively -and not only supposedly-

threatened. At this point, the most expected part of the price war is over de-escalation begins with the price restoration in the phase IV by TT and Ooredoo. That is how they started such a price war end process, signalized explicitly by the new TT CEO's public request urging the regulatory body to establish a price floor (Boumiza, 2016).

Eventually, the phase V implemented the post war tacit collusive equilibrium with the price Pca (after price war) well below the price Pcb (before price war).

4. Demand Curves Shifts of Ooredoo, TT, and Orange in Their Macroeconomic Context

Grounded on the availability of prices' chronicle, this study will try to establish the demand curves addressed to each major telecommunication providers in the 2014-2017 period. To this end, this study operates the price elasticity range of the demand of voice phone services related to the different classes of purchasing power provided by the GSMA (2018). In the following analysis and for the convenience of calculations, this study will retain its simplest average value that this study assumes stable over the related period. Besides, this study integrates the average revenue per-user (ARPU) of the voice phone calls by month and by subscriber for the three main operators published in the INTT reports. This study tries to construct such curves not only to plot their graphics but also to identify their displacements over the price competition's period. In conjunction with the advertising since the audiences are receptive to the mass media spots, the reliance of the consumer expenditure to the macroeconomic context is also pointed out to report the success or failure of the price-cut practices.

4.1. The Availability of Information and Data

To establish demand curves' equations of the mobile voice phone services' providers, this study retain arbitrarily the average of the price-elasticity reported by the GSMA (Table 2).

Table 2. The Price-Elasticity Interval of Mobile Phone calls on the Tunisian Market.

Demand	Price-elasticitiy Range	
	Min.	Max.
voice call services	- 0.65	- 0.83

Indeed, for lack of data of the different classes and user categories, it will not be practicable to set the weighted average of such short-run price-elasticity. Thus, this study retain:

$$e_x^p = -0.74 \qquad (1)$$

For the sake of clarity, it could be asked to what extent a price-cut under this peculiar price-elasticity under the unity impacts both the demand and the harvested revenues. Thus, Table 3 shows the negative effect of a price-cut on revenue even though demand has increased.

Table 3. Illustration of the Effects of a Fall in Price on Demand and in Turnover for a Price-Elasticity, Equation (1).

Price	Voice calls (mn.)	Expenditure (TND)
$P(t_0) = 0.070$	100	7
$P(t_1) = 0.063$	107.4	6.766
-10%	+ 7.4 %	-3.34 %

A 10% price-cut, for example, leads to an increase in consumption of 7.4%, but the turnover drops by 3.34%.

The telecommunication market, having an oligopolistic structure, this study determines the peculiar demand curves of each competitor insofar as these have more pertinence than the comprehensive demand curve addressed to the whole providers.

In addition, this study retains an indicative set of the per-minute prices of the mobile-to-mobile voice phone call in the period 2014-2017 in compliance with the providers' most popular offers (Table 4). It should be noted that the retained final retail per-minute price P = 0.031 TND, remains proposed, and constitutes nowadays the best offer for the mobile phone calls.

Table 4. The Representative Retail Per-Minute Prices of the Mobile Voice Phone Calls in the Tunisian Telecommunication Market

	2014	2015	2016	2017
Averaged Voice Phone Call price/mn. (TND. 10^{-3})	70	40	31	31

Source: Providers' sites and various media releases

Finally, the demand curves of each operator will be formulated integrating the ARPU amounts (Table 5) published by the regulatory body It is worth noting that the negative evolution of the Voice call ARPU for all the three providers could be correlated and/or explained by the opposed trend of the fast-growing ARPU of the data traffic (INTT, 2018:15; 2019:22; 2020b:47).

Table 5. The Average Revenues Per User by Month/Subscriber/Provider of the Mobile-to-Mobile Phone Calls

ARPU of the Mobile-to-Mobile Calls /month/ Subscriber (TND)	2014	2015	2016	2017
Ooredoo	8	7.1	5.7	4.8
TT	6.1	5.5	5.3	5.4
Orange	5.4	6.1	5.1	4.8

From ARPUs and retail prices, average demand in minutes by month/subscriber for each provider will be known (Table 6). This study note that it grew steadily for TT, while it diminished for both Ooredoo, and Orange over the last year of the retained period.

Table 6. Volume of Mobile Phone Calls for Subscribers of Each Provider (minutes/month).

Phone calls by subscribers (minutes)	2014	2015	2016	2017
Ooredoo	114	177	183	154
TT	87	137	171	174
Orange	77	152	164	154

4.2. The Demand Curves of Ooredoo, TT, and Orange

The providers' demand curve series for 2014, 2015, 2016, and 2017 could be constructed according to the short-run price-elasticity, retail prices and ARPU. Thus, this study considers the simplest form of the demand function:

$$x = C.P^{-0.74} \qquad (2)$$

x: Voice calls (mn.), P: price (TND), and C: scalar.

Therefore, the constant term C will shed light on the variation of each series of demand functions (Table 7). The finding is that for both Ooredoo and Orange, the demand functions increased between 2014 and 2015 but receded sharply in the following two years as the C scalar series have changed positively then negatively. In contrast, the demand function addressed to TT grew at all the period inasmuch C has steadily expanded.

Table 7. Change of the Constant Term C in the Demand Functions Addressed to Each Provider in the 2014-2017 period.

| C	2014	2015	2016	2017
Ooredoo	15.93	16.35	14.00	11.78
TT	12.15	12.65	13.07	13.30
Orange	10.76	14.04	12.54	11.78

It is to the right side that the demand curve of Ooredoo, the market leader, was slightly shifted between 2014 and 2015 (Figure 3a). Expressing a transitory growth, its demand curve was pushed towards the right then it switched strongly to the left during the successive two years as indicated by the arrows.

The hatched areas represent the evolution of its ARPU, from the initial to the final year of the period 2014-2017.

In contrast, the demand curve of TT, the incumbent, experienced a positive trend of its demand curve since it shifted monotonously to the right side in 2015, 2016 then in 2017 (Figure 3b).

For Orange, the last entrant in the market, and the price-cuts initiator, its demand curve jumped toward the right from the lowest towards the highest level firstly then to the opposite side revealing a continuous fall over the following two years (figure 3c).

Figure 3. Differentiated Shifting of the Voice Mobile-To-Mobile Phone Demand Curve of Ooredoo, TT, and Orange in the Period 2014-2017.
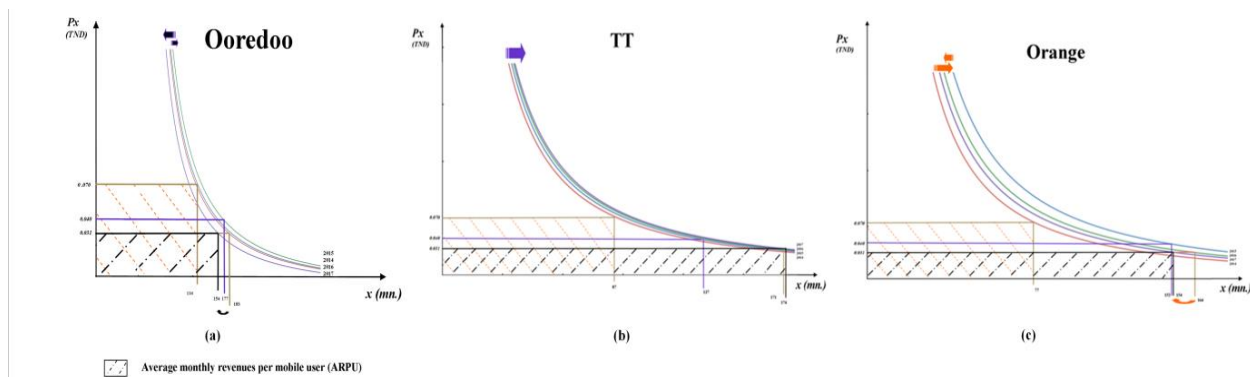
The arrow to the right indicates an increase of the demand while, to the left its contraction. The ARPU/month/subscriber of the initial and the final years of the period are the hatched areas.

(a) Ooredoo, the market leader, experienced firstly a fast-growing shift of its own demand between 2014 and 2015, and then it underwent twice a reduction in the following two years. (b) TT, the incumbent, recorded a sustained demand growth to its voice call services over the entire period. (c) Orange, the third provider mutating the duopoly market into an oligopoly structure in 2010, propelled its demand from 2014 to 2015 by its price-cuts, and then such move reversed in 2016, as well in 2017.

4.3. The Shifts Origin

Due mainly to the demand inelasticity, the price-cuts increased the volume of voice calls but reduced the ARPUs for all suppliers. However, one can wonder what the origin of the curves' displacements is. It could easily be argued that the advertising campaigns could be its causation. For example, the offer "He told them 'shut up' " by Orange, and the magic recipe of the TT: refill card 5 TND = 55 TND and its up to "1500 % bonus", smartly advertised through the mass media, were widely adopted by consumers. Ooredoo's Tit-For-Tat strategy appeared inefficient to preserve its market share while its rivals' advertising initiatives have enchanted consumers. Having reacted passively in a dynamic market, even with similar offerings, seemed to be detrimental to the market leader. Without significant churn

rate, its major subscriber base seemed kept but it prospected seducing and never seen before offers by Orange and TT by adopting a second or even a third SIM Card knowing that the switching cost became negligible.

The question that may arise is whether the results of these price cuts have been notably positive or negative for oligopolistic rivals.

Considering that such a scenario occurred under price elasticity less than the unity, competition becomes a negative-sum game. Practically, decreasing prices according the Tit-For-Tat game could upset market share, however, it leads to a drop of the revenues even if it could be associated partially to the fast-growing mobile data traffics via the Smartphone's use. In short, to obtain a greater market share, a price drop initiator must be aware that the total losses of the competitors (including it) will be greater than their gains. Surprisingly, Orange recorded an enhancement of its turnover in the related period despite the price collapse of the mobile-to-mobile voice calls whilst the incumbent maintained it. Ooredoo, the market leader, lost clearly a significant fraction of its previously harvested earnings (figure 4). Thus, Ooredoo underwent a collapse of its revenues, while TT and Orange obtained limited gains by the cross interpenetration of the three subscriber bases rather than their reshuffle by the churn rates.

Fig. 4. Turnovers from Mobile Voice Telephony services over the period 2012-2019.
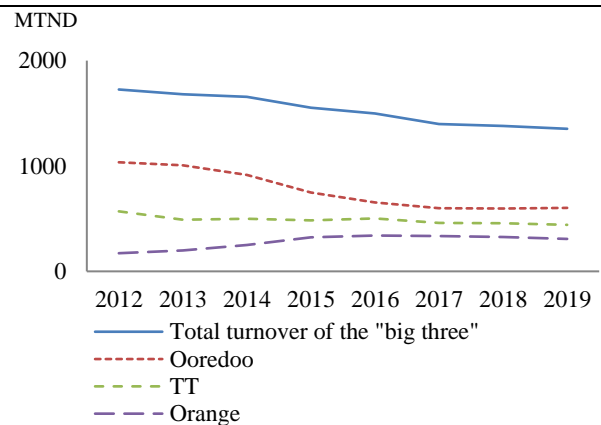
Source: INTT (2016: 9; 2020c: 10)

It should be noted that the total turnover of the mobile voice telephony market (mobile to mobile and wired) decreased from 1663 MTDN to 1367 MTND between 2014 and 2019. During the period of fierce competition, its ratio was almost 65% but was reduced to approx. 39% of the total market for telecommunications services (Fig. 5). Currently, most of the telecommunication's turnover is provided by the fixed and mobile data traffics.

Fig. 5. Revenue Ratios by Service in the Tunisian Telecommunications Sector in 2014, and 2019.
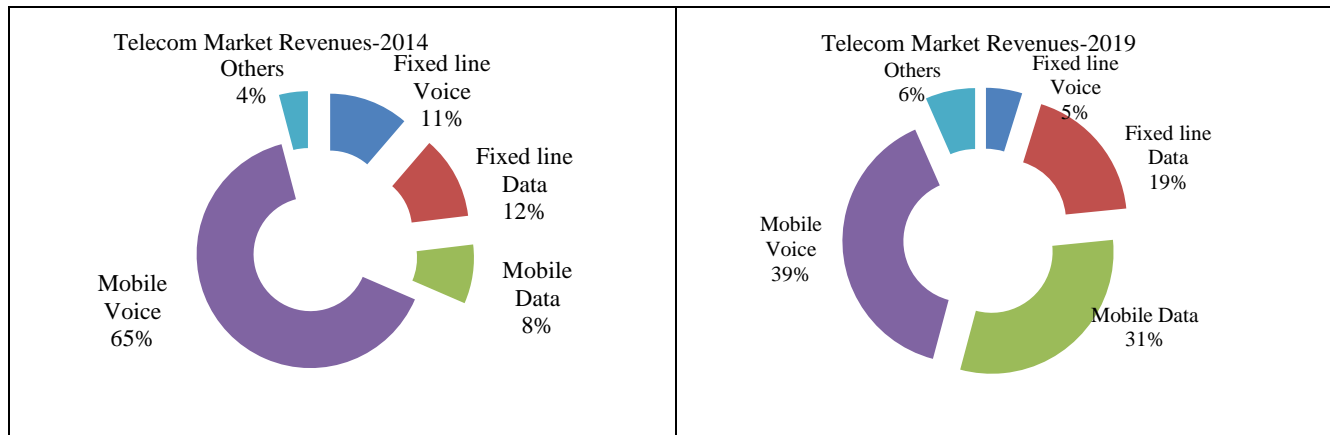

Source: INTT (2015a:4; 2020b: 2)

4.4. The Macroeconomic Situation in 2014-2017

During the period of falling prices from 2014 to 2015, Tunisia faced adverse economic conditions which led to the decline of the household disposable income (Fig. 6). In this context, it seems that there has been a negative demand shock relatively discouraging the consumption even if lower prices were proposed.

Fig. 6. The Tunisian Gross National Income per capita Decreases During the "price war" 2014-2015.
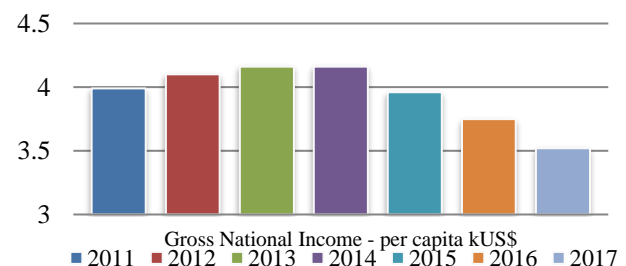
Source: World Bank (2021)

This naturally suggests that Orange's price-cuts' strategy, and replicated by its competitors, not only failed to offset the margin reduction by a significant sales' expansion but also was upset by the macroeconomic downturn. Thus, the expected increase of voice call expenditure was impeded by the demand inelasticity and the negative income shock.

That is why Duranton and Izaret (2009) stated that "a recession is no time for pricing as usual". Indeed, a firm reducing prices without considering the imminent macroeconomic downturn could enhance their market share but will not recoup their rebates.

It is appropriate to specify that studies showed that a subdued market share, like that of Orange, did not impede profitability. Shanklin (1989) identified profitable firms on lower and middle levels of market shares similar to those in its upper segment while Nagle and Müller (2018: 155, idem) stressed that "market share, rather than being the key to profitability, is, like profitability, simply another outcome of a fundamentally well-run company."

However, if Orange management had postponed the price-cuts until the economic recovery, could they have made a better result? This study could doubt it knowing that the 2G services are on a sharp decline in contrast to the data traffics as reported in Figure 5. The massive destruction of its revenues became an inevitable result with reference to the diffusion of 3G and 4G technologies. In a nutshell, Orange did not create, but rushed such a process on the Tunisian market.

5. Conclusion

The Tit-For-Tat game played in the Tunisian telecommunications market has shown a singular result of the action-reaction process of the price cuts. Orange initiated the drop in the price of voice calls, which turned into a noticeable duel between TT and Ooredoo to gain the market leadership.

In an overview of 3G licensing in European markets, Curwen and Whalley (2009) reported that its abundance provided little or no improvement in competition.

In the Tunisian market, Orange entered in 2010 relying on the breakthrough of its innovative 3G technology and started a price-cutting to attract the 2G traffics of its rivals. It had therefore concluded that lowering strongly the per-minute price of voice calls would bring more subscribers and would direct them to the consumption of GB of data where it was in a monopoly position.

Increasing the call volume seemed a secondary goal knowing the inelasticity of the voice services. The competitive advantage could have been rapidly decisive with a sustained growing trend of the data/voice ARPU ratio. However, this evolution has been mitigated given that the Smartphone dissemination in Tunisia was very weak in 2010 and that TT and Ooredoo themselves gained access to 3G, respectively in 2011 and 2012. Any Orange's strategy

of lowering voice prices to promote data services was rashly cancelled.

On their side, can it be said that its rivals have been dragged into a "price war" in spite of their will?

TT followed Orange's pricing strategy without reducing internal costs, as it has a state-owned enterprise status with the highest average number of telecom provider employees [2]. As a result, it reduced significantly its own margins but it expanded its subscriber base. Ooredoo has avoided a direct combat against Orange (left it to TT) and has played defensive moves but it drove retail price in a domain ever reached, very close to the regulated MMTR.

The Tunisian regulatory authorities have allowed competition between suppliers to play fully in order to lower prices, which ultimately benefits consumers. Before 2010, in the duopoly phase, they should have imposed a ceiling price, insofar as their non-intervention permitted to the two suppliers to generate high profits. On the other hand, within the framework of the oligopoly, with the fall in prices, it appears that MMTRs, the wholesale price of voice traffic between competing networks, was the floor price at which the market leader approached to put end to the aggressive strategy of its rivals.

At length, after nearly five years of this fierce competition to attract subscribers, one may safely consider that the competitors were compliant to the technological trends; i.e., shrinkage of the voice phone call volume by user vs. the tremendous growth of data traffics. In fact, the price war inefficiency denounced for example by Henderson (1997) could have a positive facet: the jump to a new technology with a significant consumers' surplus.

After that voice phone call market became calmer, it would then be relevant to proceed to the analysis of the competition on these mobile data services where their traffics rose by approx. 58% in the first semester of 2020 comparatively to the same period of 2019 (INTT, 2020d, p. 10). One could therefore study such a data traffic market in its phase of rapid growth and not in a period of irreversible decline, as in the present article on the mobile voice services.

Notes

1. The four Tunisian providers, Ooredoo, TT, Orange, and Lycamobile agreed the number portability services only in July 2017 (Webdo, 2017).

2. In 2012, the workforce of the main telecommunication providers reached approx. 8000, 1600, and 1200, respectively for TT, Ooredoo, and Orange, and that remained quasi stable for several years (INTT, 2015b, p. 5). This study relates such workforce volumes to the subscription bases, respectively for TT, Ooredoo, and Orange, that attain 7.8 million (1 million of which for fixed lines), 4.6, and 1.55 (only 0.05 for fixed lines), for the same year (INTT, 2012b, p. 59-60). It follows that the ratio of TT staff appears relatively high. Indeed, its number of

employees by thousand of subscriptions reaches the unit, while it is 0.35 for Ooredoo and 0.77 for Orange. This ratio must be interpreted as the key factor that drove Orange, and Ooredoo to adopt aggressive price-cut against TT.

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