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Abstract

Djibouti is very well placed, as a landing site of undersea fiber optic cables, to benefit from the digital economy. However, the prevalence of a single national telecom operator in the country has stifled service delivery and innovation in the telecom sector. Mobile broadband coverage and access to internet in Djibouti in 2018 remains below that of many Sub-Saharan African countries. This paper simulates the impact of the introduction of competition on the telecom sector's prices and its implications for households' welfare. The analysis finds important gains in welfare among current users of telecom services, with the largest gains going to the richest households. On the extensive margin, the analysis also finds a higher likelihood of take up of telecom services across the consumption distribution but skewed toward the rich. More work is needed to understand the implications of changes in the telecom sector, especially as greater access may lead to more unequal access, at least in the short term.

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Welfare Effects of Introducing Competition in the Telecom Sector in Djibouti*

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Key words: Digital Economy, telecom, market structure, welfare

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Introduction

The rise of digital technologies and the digital economy offers a once in a generation opportunity to unlock new pathways for rapid economic growth, economic mobility, innovation, job creation and access to quality services that would have been unimaginable even a decade ago. The accelerating pace of technology diffusion, the convergence of multiple technologies, and the emergence of global platforms are disrupting traditional development models. Digital technologies are expanding access to global markets, changing business models and delivering enormous productivity gains. Digitization is expanding access to basic needs and services. In 2016, the global digital economy was worth $11.5 trillion, or 15.5 percent of global gross domestic product (GDP). It is expected to reach 25 percent in less than a decade, far outpacing the growth of the 'traditional' economy.

The information and communication technologies (ICT) sector holds enormous potential for welfare improvements by creating and enabling more jobs and economic opportunities, improving labor productivity and by generating more consumer surplus (World Bank, 2016). Through these channels, continuous development of ICT services holds enormous potential for economic growth and poverty alleviation. While the internet could be an effective force of development, it also poses potential risks. Some of the key risks highlighted in the World Bank (2016) report are the risk of concentration of market power as well as greater inequality among the nation's population manifested by the digital divide. Further, issues such as privacy, cybersecurity and internet governance need to be kept in mind as approaches to regulate the internet are considered.

Djibouti is particularly well placed to take advantage of the digital economy. The country has a regional comparative advantage as the landing site of the undersea fiber optic cables. The full potential of this geo strategic position does not seem to have been exploited, however. The development of the sector has been driven by the economic strategy of Djibouti Telecom (DT) - the single national fixed and mobile operator to provide ICT services.[1] DT has a monopoly in all telecommunications markets, including those that are typically open to competition such as mobile and data services. It represents a significant portion of the economy, with revenues accounting for around 6 percent of GDP.[2]

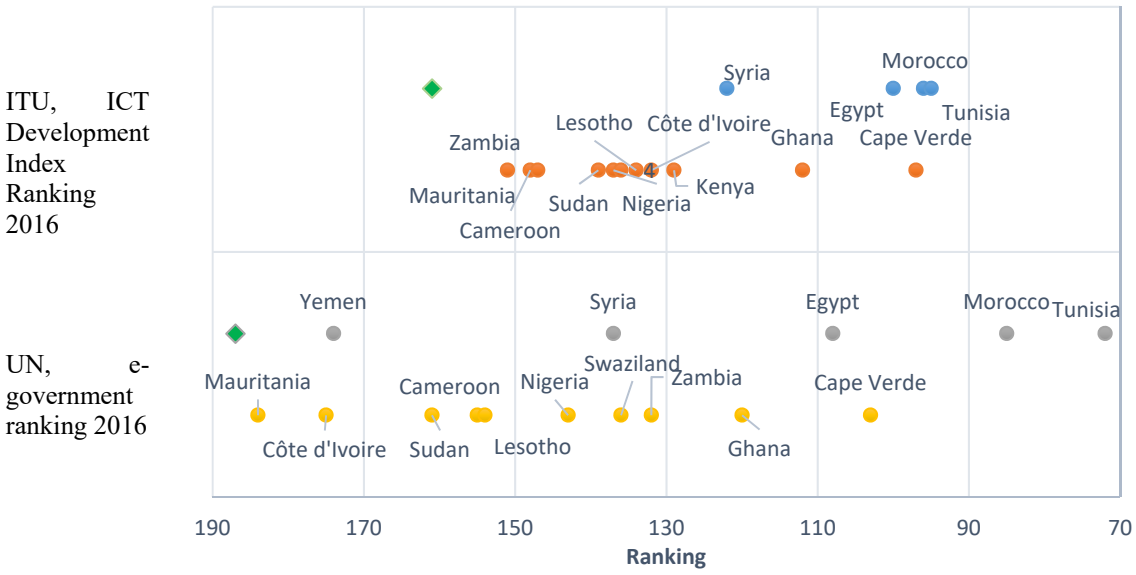
DT's strategy is outward oriented, selling much of its capacity on the international market, mainly to Ethiopia. The operator has banked on the country's geostrategic position between the Middle East and Africa to successfully become a reliable offeror of connectivity between the two regions for global communications carriers. Unfortunately, this approach has not been equally matched by efforts to expand broadband access and use in the domestic market. DT's bandwidth is not widely offered to consumers and businesses locally, leaving the domestic market in shortage.

In 2016, Djibouti ranked 161st of 175 countries in the ICT Development Index published by the United Nations International Telecommunications Union (ITU),[3] the last place among lower

[1] The only two other countries in the world with a single operator are Ethiopia and Cuba. The Democratic Republic of Korea introduced a second mobile operator in 2015.
[2] Source: World Bank, Telecommunications Sector in Djibouti: Finding the Path to Growth, 2015 (p.6).
[3] See http://www.itu.int/net4/ITU-D/idi/2016/#idi2016countrycard-tab&DJI.

middle-income (LMI) countries (Figure 1). More worryingly, the country has fallen in the rankings over the past five years. Another ranking provided by the United Nations Department of Economic and Social Affairs (UNDESA) provides a similar conclusion when evaluating the country's e-government: Djibouti is ranked 187th of 193 countries in 2016, and its ranking has dropped since 2010.[4] Finally, GSMA estimates that the unique mobile subscription penetration[5] covers less than 30 percent of the total population in Djibouti in 2018 – lagging the average of Sub-Saharan Africa (SSA) of 45%, and that of Middle East and North Africa (MENA) of 64 percent (Figure 2). A lack of competition to drive service delivery, productivity, innovation and lower prices could be one reason for the poor performance in the sector.

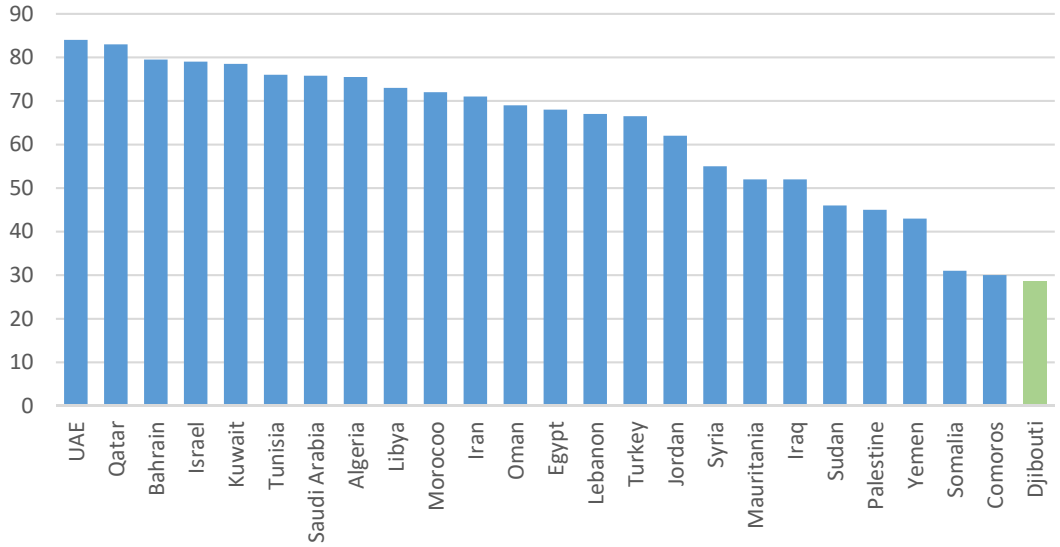
Figure 1: Djibouti has dropped in major ICT world rankings



Source: ITU (2017) & UNDESA (2017)
Notes: MENA countries in blue, SSA countries in orange. Djibouti's 2016 rank shown as a green diamond.

[4] The recent launch of the e-government site by the *Agence Nationale des Systèmes d'Information de l'État* is not likely to be captured in this ranking.
[5] The mobile connection penetration refers to a single individual that has subscribed to a mobile service and that person can hold multiple mobile connections (i.e. SIM cards). If one individual actively uses two SIM connections, that person will be counted by the industry as two mobile connections although he or she represents a single mobile subscriber. As it is common for African mobile subscribers to own several SIM cards because of difference in quality or pricing between networks, referring to unique mobile subscribers allows to have a more precise picture of the mobile penetration in a country and to perform more accurate cross-country comparisons.

Figure 2: Mobile penetration services in Djibouti is the lowest in MENA (connection penetration), even after factoring in the multi-SIM effect (subscriber penetration)



Source: Data from GSMA, The Mobile Economy Middle East & North Africa, 2018

Unfortunately, the (under)performance of the ICT sector can have significant macro-economic effects on the economy and poverty reduction (World Bank, 2016). For example, in rural Peru, the expansion of mobile network coverage boosted household real consumption by 11 percent (Beuermann *et al.*, 2012). The ICT sector also has great capability to enable job creation and innovation in the private sector with the corresponding increase in economic opportunities for the population. Moreover, the internet is also an enabler of higher labor productivity by means of lowering information and search costs. For example, the introduction of mobile phones in the grain markets of Niger led to farmers obtaining grain price information over the phone thereby reducing search costs by 50 percent (Aker, 2010) and reduced dispersion of grain prices across markets by 10 percent (Aker and Mbiti, 2010). People's perceptions also reveal that access to the internet has led to an increase in consumer welfare by making several products and services available digitally. From the standpoint of both the government and the private sector, the internet can bring major benefits in the provision and delivery of services. Digital identification can also improve participation of and help for the disadvantaged groups in the country to become integrated. The advantages of a well-developed ICT sector are manifold and transformational.

In this paper, we use data from the Fourth Djiboutian Household Survey (henceforth referred to as EDAM4) to study the effects of introduction of competition in the telecom sector in Djibouti on the welfare of its residents. EDAM4 is a nationally representative survey conducted in 2017 in Djibouti. The sampling strategy of the EDAM4 was designed to produce representative indicators at several levels: national, urban, rural, by regions and by 5 districts in Djibouti city. In a first for the Djiboutian Statistical Office (DISED), the survey collected information on sedentary ordinary households and nomads, with a total of 4,474 households interviewed. Findings from the survey

reveal that about 76 percent of the population lived in the capital, Djibouti city, while 24 percent lived in the regions.

The survey integrates several themes including, among others, recent data on household consumption and living conditions, to monitor and evaluate social development and poverty alleviation policies in the country. The survey also adopted current best practices in several aspects of questionnaire design and the analytical work subsequently done on welfare and poverty measurement. While the adoption of such changes led to a non-comparability with earlier surveys, the DISED used this survey as a new baseline from which indicators of well-being will be monitored in the future.

Using data from EDAM4, it is estimated that an important share of Djibouti's population is poor and vulnerable. As of 2017, an estimated 21.1 percent of the Djiboutian population lived in extreme poverty, spending less than DJF 117,783 per adult equivalent per year (equivalent to US$2.17 per person per day in 2011, PPP). Rural areas showed significantly higher rates with extreme poverty estimated to be 62.6 percent. The goals of eradicating poverty and boosting shared prosperity will be significantly more difficult to achieve without ensuring affordable broadband access for all, and fully embracing the transformative powers of ICT.

Provision of digital services in Djibouti

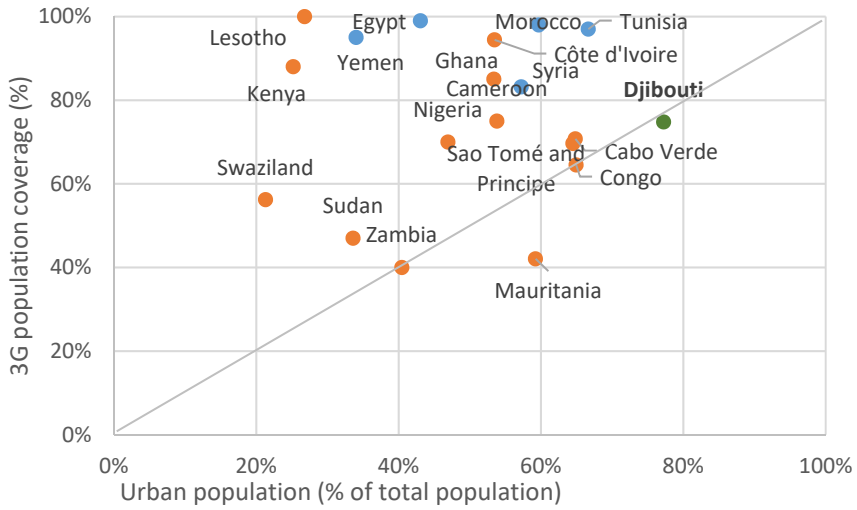
The sluggish development of the ICT sector and limited availability of digital services have differential effects across the income distribution. The subgroup of the population that is most affected by the sectoral environment is expected to be the (mostly poor) rural population of Djibouti. Despite having one of the highest proportions of urban population among the LMI countries in MENA and SSA (with about 85 percent of the population[6]), mobile broadband coverage in Djibouti in 2018 remains below the regional average (at about 76 percent), and far lower than many MENA or SSA countries which have a smaller share of urban population (Figure 3).[7] This low national coverage rate implies that the vast majority of the rural population (which account for 23% of the total population) has no mobile broadband coverage in Djibouti.

Further evidence of the disparities of access can be found in EDAM4 conducted in 2017. Results from the survey show the extent of the digital gap between the richest population and the poorest population. Eighty-nine percent of the households in the richest quintile (the top 20 percent of the households with the highest consumption levels) own at least one mobile phone, a figure similar to the households in the third quintile, where 81 percent own at least one mobile phone. However, the figure drops at 70 percent for the fourth quintile, and 41 percent for the poorest quintile (i.e. the bottom 20 percent). The discrepancy is higher in relative terms for computer ownership: whereas 27 percent of the households in the top quintile own a computer, there are virtually no households in the bottom 20 percent that own one (Figure 4). As the richest households are mostly located in urban areas and the poorest households are mostly located in rural areas, there is a

[6] World Bank, World Development Indicators.
[7] Incidentally, the number of fixed broadband subscriptions in Djibouti is also low. In 2017, there were 2.54 broadband subscribers per 100 people (World Development Indicators [accessed January 6th 2019]).

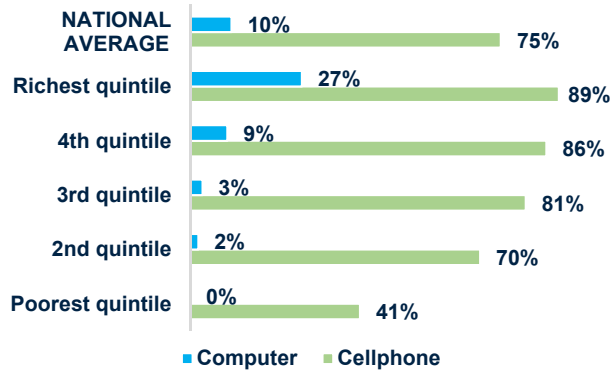
geographical digital divide between the urban population – where 70 percent of the households own at least one mobile phone – and the rural population – where only 25 percent of the households own a mobile phone (Figure 5).

Figure 3: Share of urban population and mobile 3G coverage



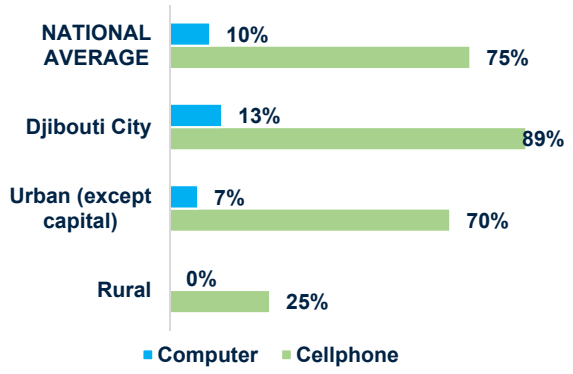
Source: GSMA (2018), World Bank World Development Indicators)

Figure 4: Digital device ownership gap between the richest and poorest households by quintile



Source: Calculations based on EDAM4

Figure 5: Digital device ownership gap between urban and rural households

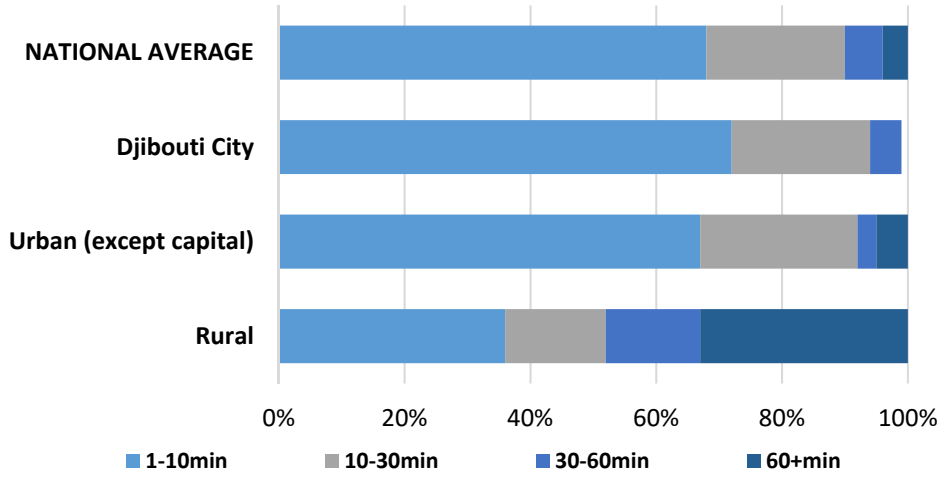


Source: Calculations based on EDAM4

The lack of mobile phone infrastructure (and associated coverage) in rural areas – combined with less than optimal transport infrastructure and low penetration of telephone service– helps explain why a large share of the rural population remains offline. Only one third of the rural population is less than 10 minutes away from a location where a phone call can be made, to two-thirds of the urban population. Even worse, a third of the rural population is more than an hour away from such infrastructure, compared to less than 5 percent for the urban population (Figure 6). There are no official coverage maps from Djibouti Telecom, but crowd-sourced coverage maps provided by

Open Signal illustrate the lack of mobile coverage in Djibouti – except for Djibouti City and main cities in the country (Figure 7).

Figure 6: Travel distance from telephone service infrastructure



Source: Calculations based on EDAM4

Figure 7: Djibouti Telecom coverage map

Source: Open Signal (2018)
Notes: red areas show bad coverage and green areas refer to good coverage.

Affordability also appears to also play an important role in explaining the low coverage of ICT services. Gelvanovska *et al.* (2014) estimated that the price of fixed broadband in Djibouti would

absorb roughly the whole income of the poorest 60 percent of the population. Currently, the cost of a basic asymmetric digital subscriber line (ADSL) package (3 megabits per second or Mbps) in Djibouti is about 90,000-100,000 DJF per year (

Table 1). This is higher than the estimated average annual consumption per capita of the bottom 20 percent of the population, and roughly equal to the estimated yearly per capita consumption of the third decile of the population (

Table 2). A 4 Mbps internet package would instead be equivalent to the yearly consumption for an individual belonging to the fifth decile of the population. The cost for the fastest ADSL service (6 Mbps) is roughly equal to the consumption level of an individual belonging to the average household in the ninth decile.[8] It is notable that these prices are substantially lower than the costs a couple years ago. According to ITU (2018), DT cut the price of an entry-level plan by 70 percent between 2016 and 2017.[9]

Table 1. Djibouti Telecom costs, by service

ADSL for private use*				
Available plans	3 Mbps	4 Mbps	5 Mbps	6 Mbps
Monthly plan	9,000 DJF	14,000 DJF	18,000 DJF	25,000 DJF
Yearly plan (15% discount)	91,800 DJF	142,800 DJF	183,600 DJF	255,000 DJF

Source: Djibouti Telecom, http://www.djiboutitelecom.dj/particulier-internet-adsl-particulier.html [accessed November 22, 2018]
Notes: * Internet for *particuliers*

Table 2. Average per capita consumption (in DJF) by quintile

Quintile	**Average per capita consumption (annual)**
1	56,182
2	108,506
3	156,757
4	224,548
5	496,690
National	208,224

Source: Calculations based on EDAM4.
Note: Quintiles based on the distribution of consumption per capita.

[8] To put this estimate in context, in 2018, the Broadband Commission for Sustainable Development agreed on a target for 2025 for entry-level broadband services at less than 2 percent of monthly gross national income (GNI) per capita. The current estimate for Djibouti for a fixed-broadband basket is 9.8 percent of GNI per capita (ITU 2018).
[9] The price drop was accompanied by a reduction in the cap (from 50 GB to 30 GB per month) and the speed (from 3 to 1 Mbit/s).

Potential impact of a new entrant on retail prices in Djibouti

While there is a broad consensus that regulatory reform in telecommunications is beneficial for businesses and individual consumers, it is very difficult to assess *ex ante* the evolution of the performance of the sector with expected changes in firm ownership, regulatory framework, and market structure (especially with the introduction of a second operator in a monopolistic market). Boylaud and Nicoletti (2001) conducted a study on OECD countries[10] and concluded that the gains in the reduction of mobile prices were linked to the number of competitors (proxied by the share of new entrants or by the number of competitors), the market shares of the competitors, the prospect of competition (as proxied by the number of years remaining before liberalisation), the specificities of the national markets, and other factors (effect of ownership, economic structure, technology and price rebalancing).

In 2002, the European Commission released a report[11] on the dynamics of the telecommunications sector in the European Union after the market liberalization. Findings suggest that new entrants usually do charge less than incumbent operators,[12] leading to a positive impact on consumers. On the other hand, it is not clear the extent to which other changes such as potential reductions in quality of service (e.g. such as a lower national mobile coverage or a lower quality of customer care) affect the overall benefits of consumers.

More recent studies have focused on the effect of market concentration on retail prices. For example, Genakos et al. (2015) focused on the link between measures of market concentration and prices paid by end users in mature OECD markets. They conclude that one additional competitor is associated to a price reduction of approximately 8.6 percent (ranging from 7.9 percent to 15.9 percent depending on numerous factors). At the same time, the authors caution that impacts from entry and mergers of different firm sizes could not be reliably established. A study[13] published by the British regulator Ofcom in 2016 contains a cross-country econometric analysis of the effects of the number of mobile networks on prices, and the effects of "disruptive" entry[14] in mature OECD markets. It finds that an increase in the number of mobile networks reduces prices by 7.3 percent to 9.2 percent. It also finds that where a disruptive player is present, prices are lower by 10.7 to 12.4 percent. This brings the total effect of disruptive new entry to 17.2 to 20.5 percent.

Even though the introduction of a new mobile entrant will surely have an impact on the performance of the sector and potentially significantly decrease retail prices, it is difficult to

[10] Olivier Boylaud and Giuseppe Nicoletti, Regulation, Market Structure and Performance in Telecommunications, OECD Economic Studies No. 32, 2001/I. Quotes come from the "Conclusions" section in p.133.
[11] European Commission, Eighth Report from the Commission on the Implementation of the Telecommunications Regulatory Package, 3/12/2002 COM (2002) 695 final, SEC (2002) 1329. Quote comes from section "3.5.7. New entrants" on p.15.
[12] For national calls, the study finds that operators charged up to 56% less in the United Kingdom, 46% less in France and 35% less in Germany.
[13] Ofcom, A cross-country econometric analysis of the effect of disruptive firms on mobile pricing, March 2016.
[14] A disruptive player is defined by Ofcom as a player that presents the following behavior: (i) introduction of new innovative services which supersede others; (ii) introduction of new production technologies that increases efficiency for existing services; and (iii) aggressive behavior where the player competes vigorously and prioritizes gaining market share above other considerations such as profits or cost recovery in the short or even medium term.

quantify this effect *ex ante*. Based on the cross-country empirical analysis mentioned above and discussions with global mobile operators, the decrease in retail prices induced by a new entrant ranges from 10 to 20 percent (in mature markets), and up to 35 to 56 percent (in developing markets, that is, the mobile market situation in the European Union in the early 2000s).

The following cases from international experience can provide hints at the potential effects in the Djiboutian context. The examples listed come from countries with a comparable population, and that have been able to develop a controlled sector by introducing a second mobile operator alongside the incumbent:

a. Cabo Verde – Population: 500,000 and two telecom operators: Cabo Verde Telecom and T +: Following an unsuccessful bidding process in 2004 for the second mobile license, the government began direct negotiations with a foreign investor (Alexander Group Telecommunications), which launched the T + operator in 2005, on a limited scale. The treasury benefited from the sale of the second license, which was purchased for the equivalent of US $ 2 million (about CVE 180 million in local currency). In 2007, the second operator finally launched its mobile services on the island of Santiago, which is home to about half of the population, and the single penetration of mobile subscribers (percentage of the population with at least one mobile line) doubled in two years from 21 percent in 2007 to 40 percent in 2009.

b. Bahrain – Population: 1.2 million, and 3 telecom operators: Bahrain Telecommunication Company, Zain Bahrain and Viva: The second operator, Zain Bahrain, is 55 percent owned by the Kuwaiti operator Zain Group, which obtained a license in 2003. The third operator is Saudi and obtained his license in 2009 and was fully operational in 2011. Additional licenses generated approximately US $ 33 million (approximately BD 83 million in local currency) and approximately US $ 500,000 of annual spectrum fees. The introduction of the third operator boosted competition and increased subscriber penetration from 65 percent in 2010 to 91 percent in 2009.

c. Brunei – Population: 393,162, and two telecom operators: DST-Group and B-mobile: The second operator (B-mobile) was a joint venture between the local fixed operator TelBru and a local conglomerate (QAF Comserve) and launched its operation in 2005. The amount of the second license is not disclosed, but the introduction of competition boosted single subscriber penetration from 47 percent in 2005 to 67 percent in 2007.

To further explore the potential effects of changes to the structure of the ICT sector, we conduct the following thought exercise. In the presence of more competition, what could be the potential effects on prices in telecommunication services in Djibouti? And, what would be the potential effects in terms of increased welfare for households? The results of this simulation are presented in the next section.

Simulating increased competition in the ICT sector in Djibouti

We use the EDAM4 data from 2017 to explore the ICT sector in Djibouti and conduct a simulation on the potential benefits of market forces in decreasing the prices of ICT services. We present basic summary statistics on expenditures related to the sector. Next, we discuss the methodology and the tool used for simulations, before presenting the findings.

We identify as "consumer of telecom services" the households that responded having spent money during the past month[15] on fees on phone services (fixed or mobile), bought mobile "credit", used a phone booth, and/or paid a monthly contract for phone (fixed or mobile) or internet services. Table 3 presents the percentage of the population that reported positive expenditures in each of the telecom items, as well as reporting spending in "any" of these categories. The relatively low penetration of telecommunication services among the Djiboutian population partly explains why only about 22 percent of the population is found to be a telecom user, with this share being driven mostly by purchase of cards of credit for mobile phone minutes and/or data. There are marked differences in usage rates across the consumption distribution. Among the poorest decile, less than 5 percent of the population declared having expenditures on telecom services. This rate increases with the level of consumption reaching 23 percent around the middle of the distribution and to about 35 percent among the top 10 percent (

Table 4). Expenditures on telecom services also appear to be correlated with the level of consumption, with users in the top 10 percent of the distribution spending more than 10 times the level of expenditures of those in the bottom 10 percent. It is notable that users devote similar shares of their total expenditures to telecom services.

Table 3. Percentage of the population reporting expenditures on telecom services

Telecom Service	% Consumed
Fixed, mobile or cellular telephone, fax or fax machine	1.0%
Repair of telephony and fax equipment	0.2%
Purchase of card for landline / mobile / transfer credit	15.5%
Telephone communication in a phonebooth (cabine)	8.6%
Subscription fee landline / rural telephone	1.9%
Other telephone and telegraph services	0.0%
Internet subscription fees	2.2%
Internet connection fee (including cybercafe use)	0.5%
Telecom bundle (any telecom service)	21.8%

Source: own calculations using EDAM2017.
Notes: Consumption is based on reporting expenditures in the category during the last reference month.

[15] This will clearly underestimate current users as many households may have phones but not purchased these items in the reference month when the survey was conducted. As noted above, about 75% of the population has a mobile phone, but the percent of users with recurrent payments is much lower.

Table 4. Summary statistics on telecom expenditures and users

Decile	Telecom Consumers (%)	Annual consumption of telecom services	Annual cons. of telecom among consumers	Consumption per capita	Consumption per capita among telecom consumers	Telecom expenditure as a % of total expenditure	Telecom expenditure as a % of total expenditure of consumers
1+	4.1%	166	4,009	40,491	50,457	0.0%	1.2%
2+	13.1%	1,004	7,668	71,982	74,627	0.2%	1.3%
3	16.6%	1,570	9,468	97,836	99,662	0.2%	1.1%
4	22.2%	2,401	10,800	119,223	120,107	0.2%	1.1%
5	22.9%	6,946	30,367	143,328	143,115	0.4%	1.9%
6	22.8%	4,557	19,967	170,249	169,540	0.4%	1.6%
7	27.2%	5,034	18,504	203,287	202,935	0.4%	1.4%
8	25.3%	7,525	29,757	245,532	247,397	0.4%	1.7%
9	29.2%	17,411	59,569	318,732	324,248	0.7%	2.4%
10	34.6%	21,704	62,762	672,770	699,677	0.6%	1.8%
Overall	21.8%	6,822	31,299	208,224	266,367	0.4%	1.6%

Source: Calculations based on EDAM 4. Note: + Deciles based on the distribution of consumption per capita. The coefficient of variation of telecom usage was 20 percent or higher in deciles 1 and 2 (greyed out) and thus may be interpreted with caution.

To conduct the simulation, we apply the World Bank-developed tool on Welfare and Competition (WELCOM). The tool allows simulation of the distributional effects of changes in market competition through prices. In short, the tool: i) estimates the expected change in prices resulting from the increased competition by assuming that after new entrants come into the sector the market structure behaves as in perfect competition with the price dropping to marginal cost; ii) identifies all users of telecom services; and iii) applies the estimated price decrease to households that are currently users of telecom services as an estimate of their gain in welfare.[16] Given the lack of guidance in the literature on an appropriate elasticity for telecom services, we run the simulations assuming a price elasticity of -1.5 and -2.5 to provide a range of results. Of note is that in both cases the simulations assume that the demand for communications services is elastic, since in monopolistic markets the firm optimizes its output in the elastic section of the demand curve. Thus, we present the results for the simulation where the opening of the sector leads to a drop in the market share of the incumbent firm to half of the market. That is, we simulate the expected effects in the short- or medium-term after the opening of the sector.

[16] For a more detailed description of the methodology, see Araar *et al.* (2018).

Table 5 presents the main results from the simulations. Results from the poorest quintile are not shown due to small sample sizes. As expected, both simulations show a decrease in price after a new entrant establishes itself in the telecom sector. In the scenario where individuals are assumed to be less responsive to price changes, the price of telecoms experiences a drop of 22 percent, whereas when individuals are more responsive, the price drops by 13 percent. In terms of welfare gains, they follow the patterns of consumption observed above with richer individuals spending more on telecom services than poorer individuals. Thus, they reap more of the benefits of a decrease in prices. Under the lower elasticity scenario, an individual in a household that uses telecom services in the second quintile is estimated to experience a welfare gain of 828 DJF. In the same scenario, an individual in the top 20 percent would gain 7,347 DJF. Corresponding to the lower price change in the scenario of an elasticity of -2.5, the welfare gains are lower across the distribution.[17]

Table 5. Results from WELCOM simulations

	Elasticity = -1.5	**Elasticity = -2.5**
Price change	22.2 percent	13.3 percent
	Welfare gains (DJF per year)	
Quintile 1	n.a	n.a
Quintile 2	828	276
Quintile 3	1,792	597
Quintile 4	2,290	763
Quintile 5	7,347	2,449

Source: own calculations using EDAM 4.
Note: Quintiles based on the distribution of consumption per capita. Results for the bottom quintile are not shown as it is considered that there is too little information (i.e. sample size) to draw reliable estimates.

The welfare gains are low with respect to the overall level of consumption in each quintile, and thus are not conducive to tangible changes in poverty or inequality. It is important to highlight that the results presented are limited as they can simulate the potential welfare gains only among *current* telecom users. In a context such as Djibouti, an equally important question would be: What would happen to the individuals who are not currently consuming these items (due to several reasons including affordability or coverage). That is, given an expected drop in price and an associated welfare gain, should we expect more people to adopt and use telecom services?

We attempt to answer this question by conducting the following thought exercise. First, we run a probit model to look at the predictors of telecom usage among the Djiboutian population. We use

[17] A complementary exercise was run for only the prepaid cards for mobile credit. Results show again that the highest gains are accrued to the top 20 percent of the population (due to their higher expenditures on such items). The welfare gains gap is smaller though. Under an elasticity of -1.5 the top (second) quintile would gain 4,810 (826) DJF per year. Under the high elasticity scenario of -2.5 the richest quintile would gain 1,603 DJF and the second quintile would gain 275 DJF. The small number of consumers of "internet contracts" prevented us from running a simulation for this telecom service.

as covariates a series of household characteristics, household head characteristics, dwelling characteristics, location variables, the household's consumption level, as well as the usage of telecom services among households in the same primary sampling unit (PSU). We estimate the probit via a stepwise regression and find that consumption level and access within the PSU are highly correlated with telecom usage. Second, we simulate the increase in the probability of using telecom services by assuming that all *nonusers* would (potentially) benefit from the welfare gains just described based on the quintile of consumption that they currently belong. Table 6 illustrates that there are important potential gains in the extensive margin (that is, take up of telecom services). Using the most conservative elasticity as benchmark, households in the second quintile would be almost 5 percentage points more likely to use telecom services. The probability of take up is higher among richer households: an increase of 8.9 percentage points in the likelihood of take up is expected if the potential gains would be assumed as a direct transfer to the household (and assume all other covariates constant).

Table 6. Estimated increase in probability of using telecom services due to welfare gains

	Elasticity = -1.5	**Elasticity = -2.5**
Quintile 1	n.a	n.a
Quintile 2	4.7%	3.9%
Quintile 3	5.6%	4.8%
Quintile 4	6.4%	5.5%
Quintile 5	10.2%	8.9%

Source: own calculations using EDAM 4.
Note: Quintiles based on the distribution of consumption per capita. Results for the bottom quintile are not shown as it is considered that there is too little information (i.e sample size) to draw reliable estimates.

Conclusion

In this paper, we bring some insights as to the hypothetical gains to the population that an opening of the telecom sector could bring about in Djibouti. The ICT sector is currently believed to be below its potential, thus limiting the access to such services and, somewhat indirectly, preventing more spaces for the private sector in Djibouti to become bigger players in the economy. From a relatively narrow angle of welfare gains to households, the simulations presented here hint at important gains in welfare due to the expected price decreases following increased competition in the sector.

More work is needed to fully understand the implications of changes to the telecom sector in Djibouti. For instance, a yet to be published 2018 survey on telecoms usage conducted by DISED can provide additional insights on the sector. The huge potential the sector holds for contributing to the development of the country should be enough incentive to pursue this important agenda.

References

Aker, J. C. (2010). Information from markets near and far: Mobile phones and agricultural markets in Niger. American Economic Journal: Applied Economics, 2(3), 46-59.

Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. Journal of Economic Perspectives, 24(3), 207-32.

Araar, A., Malasquez, E., Olivieri, S., & Rodriguez-Castelan, C. Introducing WELCOM: A tool to simulate the welfare impacts of competition. mimeograph.

Beuermann, D. W., McKelvey, C., & Vakis, R. (2012). Mobile phones and economic development in rural Peru. The journal of development studies, 48(11), 1617-1628.

Boylaud, O., & Nicoletti, G. (2000). Regulation, market structure and performance in telecommunications.

European Commission, Eighth Report from the Commission on the Implementation of the Telecommunications Regulatory Package, 3/12/2002 COM (2002) 695 final, SEC(2002) 1329. Quote comes from section "3.5.7. New entrants" in p.15.

Gelvanovska, N., Rogy, M., & Rossotto, C. M. (2014). *Broadband networks in the Middle East and North Africa: Accelerating high-speed internet access*. The World Bank.

Genakos, C., Valletti, T. M., & Verboven, F. (2017). Evaluating market consolidation in mobile communications.

GSMA, The Mobile Economy Middle East & North Africa, 2018

ITU. 2018. *Measuring the Information Society Report*. Vol. I. Geneva: ITU.

Ofcom, A cross-country econometric analysis of the effect of disruptive firms on mobile pricing, March 2016.

World Bank (2016) World Development Report 2016: Digital Dividends. Washington, DC: World Bank. doi:10.1596/978-1-4648-0671-1. License: Creative Commons Attribution CC BY 3.0 IGO