WHAT DOES IMPROVED SPECTRUM MANAGEMENT MEAN FOR THE PHILIPPINES?

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Abstract

This paper analyzes spectrum management practices in the Philippines. It examines the literature on what the Philippines and other countries have done when it comes to allocating spectrum rights. The regulatory body in the Philippines allocates available spectrum via an administrative approach which lacks transparency and due process. This paper recommends that the regulatory body adopts the auction method in allocating spectrum. This method has been proven to be transparent, fair, and cost-effective method if a suitable design is adopted. There are very few studies that look at spectrum management in the Philippines. This paper offers some policy recommendations that can help the Philippines in allocating spectrum rights more efficiently and increase its government's revenues.

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1. Introduction

Radio frequency spectrum is a valuable intangible resource with varying uses such as radio broadcasting, television broadcasting, military and government communication, medical and scientific communication, radio astronomy, and mobile broadband. The different frequencies within the spectrum define the boundaries of the spectrum. The spectrum bands can carry and transmit information and its physical attributes define which frequency band can be used for a given technology and for a particular type of information (Blackman and Srivastava, 2011; Dinkelman, 2013).

Spectrum management is the process of regulating the radio spectrum so as to efficiently allocate this scarce resource among a number of users. It arose from the need to prevent interference among users of adjacent frequencies or those from neighboring geographic areas. The need for efficient spectrum management increased due to various technological innovations: first television, then cellular phones and internet. Spectrum management thus acts like a traffic cop. It enables the smooth flow of data and prevents anarchy in the airwaves. Spectrum is a very precious resource which must be managed to ensure efficient and equitable access for its services, and whoever controls the access to the spectrum will also control much of the means of conveying information (ITU, 2016).

The underutilization of spectrum assets is blamed for relatively slow speed of Philippine internet connections vis-à-vis its Asia-Pacific neighbors (see Table 1). This paper analyzes spectrum management practices in the Philippines. It examines best practices in spectrum management and the impact on consumers of reallocating unused frequencies.

Table No. 1. Average connection speed (IPv4) in Asia-Pacific Region (Third Quarter 2016)

Global Rank	Country	Average Mbps	Quarter on Quarter Change	Year on Year Change
1	South Korea	26.3	-2.5%	28%
2	Hong Kong	20.1	3.4%	27%
6	Singapore	18.2	5.3%	45%
7	Japan	18.0	5.1%	20%
18	Taiwan	14.9	-4.3%	48%
36	Thailand	11.7	-15%	42%
40	New Zealand	11.3	6.6%	30%
50	Australia	9.6	13%	23%
63	Malaysia	7.5	9.3%	53%
76	Indonesia	6.4	9.1%	115%
77	Vietnam	6.3	22%	85%
79	Sri Lanka	6.0	5.9%	18%
85	China	5.7	9.5%	55%
103	Philippines	4.2	-2.8%	49%
105	India	4.1	14%	62%

Source: Akamai (2016).

2. Spectrum allocation methods

Spectrum allocation process is important because the method chosen by the regulator determines the resulting structure of the industry. Also, a flawed allocation process can lead to anti-competitive and inefficient allocation of radio frequency spectrum. This scenario is called "regulatory failure."

There are basically four types of spectrum allocation methods utilized with varying degrees and forms of transparency in different jurisdictions: (1) administrative approach, (2) auction or public-bidding approach, (3) trading approach, and (4) use-or-lose-it approach. The administrative approach is sometimes called the "beauty contest" approach. In this approach, applicants are evaluated on specific qualifications and criteria, and the "most attractive" applicants are assigned the spectrum. When demand exceeds the number of spectrums to be allocated, this method is tweaked by employing technical, financial, operational, geographical, and social criteria and weighting them to produce a weighted composite score for each applicant. The applicants obtaining the highest weighted scores will get the available spectrums. The auction approach is employed using sealed public bidding (on site or electronically) based on the applicants' perceived commercial valuation of the radio frequency or based on the minimum economic value imposed by the regulator in the bidding documents. If done well, this approach could raise billions of pesos for the government. The trading approach is a "first-come-first-served" allocation system and allowing spectrum holders to trade excess spectrum in the market. And the "Use or Lose It" approach is intended to prevent warehousing and hoarding of spectrums. And it imposes penalties to holders inefficiently utilizing their existing allocation.

In terms of transparency, the auction approach is the most transparent and could be the most efficient approach if it is well designed and implemented. It may require regulators with weak institutional capacity to seek the assistance of outside experts (Christopher, 2016). On the other hand, the administrative approach is the least transparent and encourages hoarding. On a case-to-case basis, the regulator may allow the sale of the operator's allocated spectrum to other operators (incumbents or new entrants).

3. Spectrum management in the Philippines

The National Telecommunications Commission (NTC) is tasked under Republic Act 7925 to manage and award spectrum licenses. All spectrum user fees collected by the NTC go to the National Treasury. Republic Act 7925 stipulates that when demand for frequencies exceeds supply the NTC can award frequencies through an open tender process. However, no biddings have ever taken place. The telecommunications companies have always been assigned frequencies by the Commissioner. Republic Act 7925 also mandates that the government shall allocate the spectrum to service providers who will use it efficiently and effectively to meet public demand for telecommunications service. However, NTC never implements the use-or-lose-it approach based on this mandate. There seems to be a lack of transparency in how frequencies are valuated. There is also a lack of due process on how the spectrum is allocated and this is a concern as the number of broadband users increases. Most of the spectrum bands have already been allocated to the big companies without regard for smaller players and new entrants (Mirandilla-Santos, 2016).

World Bank (2005) analyzed NTC's spectrum management practice this way:

> NTC has limited capacity and resources to set and implement spectrum management policies. A major issue in this regard is the inability of NTC to utilize the proceeds from its fees for spectrum usage to manage and monitor this resource. All of the revenue from NTC fees goes to the general revenue fund of the government and it has virtually no budget for new equipment or staff support. This lack has led to a largely passive mode of regulation, by necessity. As a result, there has been little enforcement to ensure that allocated spectrum is in fact used effectively and efficiently. (p. 177)

One spectrum management issue that sticks out is the unused 700 MHz band owned by San Miguel Corporation (SMC). Recently SMC sold its telecommunications assets to both Globe Telecom Inc. and Philippine Long Distance Telephone Company (PLDT). Some see an issue in this because the frequencies were awarded without any due process. The Philippine Competition Commission (PCC) indicated that out of the 90 MHz of the 700 band that SMC held, PLDT and Globe will each have 35 MHz of the 700 band while 20 MHz will be left vacant. The PCC expressed concerns that the SMC deal leaves little spectrum to a potential third player in the market while it gives PLDT and Globe a huge advantage over potential market entrants (PCC 2016). On August 26, 2016, the Court of Appeals issued a writ of preliminary injunction that stopped the Commission from investigating the deal. The ability of the big telecom players to use the court system to delay or overturn the decisions of regulators that adversely affect them exposes the weakness and ineffectiveness of the regulatory structure in the country (Mirandilla-Santos, 2016). The NTC's "beauty contest" spectrum allocation system is being criticized for its lack of transparency, and for treating spectrum licensing information as confidential (Galla, 2016). The PCC's preliminary assessment of the Globe-PLDT-SMC spectrum deal is that the transaction will leave a limited amount of spectrum to a potential third player. It also stated that the amount of available spectrum post-transaction may not be sufficient for a new player to exert competitive pressure on PLDT and Globe (PCC, 2016). Critics are unfairly riding on this hot issue and injecting misinformation in the media. For instance, Democracy.Net.PH claimed that there were "zero" available frequencies in the broadly used 900 MHz and 1800 MHz for a new player. Yes indeed, but this situation existed before the deal.

4. Spectrum management in the United States.

In the United States radio spectrum frequencies were initially allocated by conducting hearings. Aside from the low application costs these licenses were given out by the Federal

Communications Commission (FCC) for free (Christopher, 2016). The hearings were held in order to determine which applicant advanced best the "public interest" but what determines the "public interest" is a contentious issue. The rise of television and the advent of cellphones flooded the FCC with license applications. Congress passed legislation in 1983 to hand out spectrum licenses via lottery. The problem with the lottery though is that some firms acquire frequencies for free and then sell them to third parties for a handsome profit. In 1993 Congress passed a law ordering the FCC to sell spectrum licenses via auction. Nobel Laureate Economist Ronald Coase was one of the early proponents of auctioning off spectrum licenses. In his paper, he stated that the allocation of resources should be left to market forces and not government decisions (Coase, 1959). Economists Paul Milgrom and Robert Wilson were able to design an auction mechanism for the FCC that solved "the exposure problem". The exposure problem is where one player wins the bid for one state and thwarts the plans of other players to expand nationally or to a region which includes the state that the player won. The player can hold the state "hostage" and ask for a huge payoff in exchange for the spectrum rights for that state. This problem thus reduces the incentives in taking part in the auction. Kwerel and Felker (1985) state that auctions are better than lotteries or hearings because requiring the winner to pay for the license is an efficient way of reducing the number of license applicants. Conducting auctions according to them is also cheaper than doing hearings or lotteries. The first auction was held in 1994 and it generated $617 million for the FCC (Christopher, 2016). Meanwhile, the British spectrum auction of 2000 raised $34 billion (Milgrom, 2004).

The FCC imposed limits on the amount of spectrum any company could control in any geographical area in order to avoid an outcome when companies gain control of enough of the spectrum to manipulate market prices (Milgrom, 2004).

In 2016, the FCC for the first time held an incentive auction. This auction repurposes the spectrum by encouraging licensees to voluntarily relinquish spectrum usage rights in exchange for a portion of the proceeds from the auction (FCC, 2016). The auction benefits consumers by making these frequencies available for wireless broadband thus easing congestion on wireless congestion and enabling the rollout of fifth generation (5G) services and applications. Stage 1 began on May 31, 2016 and ended on August 31, 2016. Stage 2 began on September 13, 2016 and ended on October 19, 2016.

One issue that has been prominent in the US lately is the issue of net neutrality. In June 2016, the US Court of Appeals in a 2 to 1 decision said that the internet is a utility not a luxury and thus it should be valuable to all Americans (Kang, 2016). This means that broadband companies cannot block or slow the delivery of content to consumers. Without this decision, providers can create fast and slow lanes on the internet subjecting businesses and consumers to extra charges and limited services. There are parallels going on in the Philippines with its slow internet speeds. A net neutrality rule wherein the role of the internet as a utility is confirmed is needed to ensure that the big companies do not open up fast and slow lanes to the internet and enable full and equal access to the internet for everyone.

5. Trying to eliminate guesswork

When it came to the situation in the US, it was obvious that personal communications services licenses were substitutes to one another. The main issue was to minimize guesswork allowing the bidders to choose substitute licenses based on their relative licenses. Because of this the auction was designed as a single open auction where all licenses will be sold at once. During this process, companies could place bids on any of the licenses and track bids on all licenses. Bidders can switch among substitute licenses which promotes equal prices among these licenses. Bidding on all licenses remains open until no new bids are received for any license (Milgrom, 2004). The problem with this though is the auction might drag on for a long time as bidders initially bid on a few licenses even though they intend to acquire much more. The FCC thus decided to apply Milgrom's "activity rule". This rule has two concepts: activity and eligibility.

Activity is based on the number of licenses a bidder has put bids in a particular round. It can also be based on the total bandwidth of the licenses bid or the bandwidth multiplied by the population covered. The rule prohibits a bidder's activity from exceeding its eligibility. Initial eligibility is determined by filing an application and paying a deposit. Subsequent eligibility depends on previous bidding activity. Bidders who are not active in the initial rounds of the auction lose their eligibility in later rounds.

The simultaneous auction mechanism has been modified for other applications. In electricity markets for example, there are many units of each kind of item. What happens then is that each bidder makes a bid on the quantity it demands on a clock that all bidders can see. The clock starts at a low price and raises the price whenever demand outstrips supply. The auction ends when both demand and supply are equal. The British government used a clock auction in 2002 to buy carbon dioxide emission reductions from firms. Electricite de France (EDF) used a variation on the clock auction when it sold electricity contracts in 2001. The contracts had different lengths (three months to two years) of time but they all started in January 2002. EDF regarded the contracts as substitutes because buyers wanted different contract lengths and all contracts covered the first three months of 2002. Lawrence Ausubel and Peter Cramton helped EDF develop the auction. The first step was to develop a method for rating the bids. Specific price differences were put in place between three-month contracts and contracts lasting six, ten, twelve, twenty-four and thirty-six months. The price clocks were controlled so as to maintain these price differences. Prices rose until the total demand remaining exhausted the total power available for the initial three-month time span. This type of auction promotes competition among bidders of contracts of different lengths. It also increases revenue and efficiency compared to traditional models. The EDF auction also included a "supply curve" so that the total quantity of power depends on the price level.

6. Spectrum auctions: The case of New Zealand

In 1990, New Zealand held its first radio spectrum auction (Milgrom, 2004). Based on the advice of NERA Economic Consulting, the country adopted a second-price sealed-bid auction. Under this system, each bidder submits a sealed bid and then the license is awarded to the highest bidder at a price equal to the second highest bid. There are a couple of advantages to this system. First, it replicates what happens in an ascending bid auction without the need for bidders to be assembled together. Second, each bidder has a simple strategic problem. They have to determine their own reservation value and bid it. However, there were issues with this system. The actual auction produced revenue that was lower than expected. The bid data showed that there was no solid relationship between demand for licenses, number of licenses acquired and the prices paid for those licenses. There would be huge gaps between the highest bid and the second-highest bid resulting in companies acquiring licenses cheaply. Because of the disappointing results the New Zealand government shifted to a first-price sealed-bid format where the highest bidder pays the amount that it bids. This format change did not solve the problem of unlinked auctions where the licenses for sale could be substitutes or complements. This issue could result in bidders buying too many or too few licenses which then results in a guessing game where luck is a huge factor. This results in random allocations where bidders who value the licenses the most rarely gets those licenses.

Milgrom (2004) stated that other auction designs could have worked better in New Zealand. He proposed the Dutch flower auction system wherein the first round winner can take as many lots as it would like at the winning price. The right to choose next could be auctioned off in the next round and so on. Thus, there would be no guessing on which license to bid on under this system. Each bidder is assured that if it wins, they can acquire the number of licenses that they need at the bid price they chose. Another option is to allow bidders to specify both price and desired quantity. The highest bidders usually will get the full quantity they desired with only the last winning bidder having the probability of getting only a portion of their desired quantity. This is more efficient

because it eliminates guessing which licenses should a bidder bid on. It also reduces exposure risk wherein a bidder buys too few licenses to build an efficient system which results in losses for the bidder.

7. Implications of improved spectrum management for the Philippines

Mirandilla-Santos (2016) cited several reforms in order to promote investment and innovation in communications and connectivity. One is to amend Republic Act 7925 so that companies no longer need to get a franchise for Congress and anyone who is able to put up internet infrastructure can do so regardless of size, nationality or whether it is public or private. She also calls for amending Commonwealth Act 146 so that it reflects the realities of the information age. Currently, there is ambiguity in Commonwealth Act 146 in the definition of public utility which is often used interchangeably with public service. A national broadband plan to improve internet speeds and access to underserved areas is needed. The US has already adopted a national broadband plan in 2010.

In order for the country to fully reap the rewards of the information age effective spectrum management must be done. Mirandilla-Santos (2016) proposes that the NTC develop a spectrum management plan in coordination with various stakeholders. She also advocates for a transparent allocation process which includes a clear set of criteria as well as a mechanism for the valuation of the spectrum and a publicized allocation process. The reassignment of frequencies from low value to high value applications, similar to what the US is currently doing, must be done too. Another suggestion is to deregulate some frequencies especially those used for industrial, scientific and medical purposes. By making these frequencies free (which in most countries is the case) could help spread internet connectivity in unserved or underserved areas.

The International Telecommunications Union (2005) listed several best practices for national spectrum management. Among their suggestions include: (1) establishing a national spectrum management organization that is either independent of or part of the telecommunications regulatory authority; (2) promoting transparent, fair, economically efficient and effective spectrum management policies; (3) making public whenever possible national frequency allocation plans; (4) removing regulatory barriers and (5) assuring open and fair competition in the market. However, Strategy& (2016) cautions countries to avoid or manage the so-called "national broadband acceleration risks." For instance, Australia's initial cost estimate for an NBN was $30 billion, but it grew to $52 billion; and in 2015, Australia's rank in the 2015 Networked Readiness Index (NRI) fell from 25th to 42nd due to poor quality service.

8. Conclusions

An effective spectrum management is needed for the Philippines. Auctions have become the most effective and transparent way of allocating spectrum frequencies and this has been used in the US, Canada, Germany, United Kingdom, New Zealand, India, and other countries. Creating an efficient mechanism facility for the Philippines, similar to the creation of the wholesale electricity spot market (WESM) in its power industry would have advantageous effects for the Filipino consumers.

It is time to abandon the present "beauty contest" allocation system which assigned spectrum rights to firms that are not utilizing them, and adopt a more transparent, fair, and cost-effective allocation system.

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