

International Survey of Spectrum Assignment for Cellular and PCS

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I. **Executive Summary**

This paper reports the results of a survey of thirty different cellular and PCS licensing events in twenty-five countries. It concludes that 1) the United States has the most advanced and successful auction methodology in the world today, 2) the use of auctions to assign spectrum will continue to increase around the world as more countries liberalize their telecommunications sectors and 3) U.S. auctions encompass all six factors identified in successful license assignments around the world.

The main factors of success identified across countries are 1) transparency of the decision-making process, 2) wide qualified participation by bidders/applicants, 3) sub-national licensing, 4) concurrent assignment of similar licenses when feasible, 5) clear rights & responsibilities in the tender documents and license agreements and 6) more rather than fewer licenses allocated. This report highlights the presence or absence of these factors in ten case studies of successful and less successful license assignments during the last seven years.

In addition, the paper describes the social, financial and political environments in which auctions exemplify their greatest potential: 1) credible rules supported by credible laws, 2) well developed financial markets, and 3) absence of supranationally imposed restrictions.

II. Introduction

1. Summary

The Federal Communications Commission (FCC) recently used a simultaneous multiple round auction to assign 493 regional C-block personal communication services (PCS) licenses throughout the United States. These auctions, which lasted just over four months, were the most advanced of their type anywhere in the world for the assignment of radio spectrum licenses. Comparative hearings, which were used in the early 1980s, would have taken several years to complete the same task. Participant response has been overwhelmingly positive to the auction methodology. Criticism has focused more on the rules of participation and payment schedules than on the method of assignment. The U.S. Congress and the White House have both eagerly endorsed auctions as the preferred method for assigning radio spectrum.

The preferred method internationally for assigning cellular and PCS licenses, though, is still comparative tenders. Only a handful of countries have used auctions to assign cellular licenses, but these auctions have generally been limited to a single-round design. In most cases, national licenses, not regional licenses, were awarded. An increasing trend to include a financial bid in the comparative tenders corresponds with the continuing liberalization of telecommunications markets around the world. Liberalized markets lead to more open entry and a greater number of applicants for licenses. As more qualified bidders compete for future licenses, assigning authorities will increasingly find the economic-based principles of auctions to be more effective than traditional comparative tenders.

Several countries, which now have a higher mobile telephone penetration than the United States, did not use auctions to assign their licenses. What factors in these license assignments help us understand their successful outcome? Among others, these factors include the early licensing of many operators in a single market, simultaneous assignment of similar licenses, and clear rights and responsibilities in the tender and license documents.

2. Purpose and Methodology

This paper presents the findings of an extensive research project commissioned by the Auctions Division of the Wireless Telecommunications Bureau and the Office of Plans and Policy

at the Federal Communications Commission to benchmark current FCC auction practices with international spectrum assignment practices and improve the FCC's ability to learn from the experience of foreign governments on issues relating to spectrum assignment. Research focussed on thirty separate license assignments in over twenty five countries during the period December 1989 through June 1996. The per capita income of these countries varies from \$1,360 to \$24,530 and their population ranges from 2.6 million to 936 million. The licenses span the entire technological field: AMPS, D-AMPS, CDMA, DCS-1800 & 1900, GSM, PCS, PHS, and TACS. The length of the assignment process, from public notice of license to assignment of license, varied from three months to 33 months. The number of bidders in an assignment process ranged from one to over one hundred.

An initial screening of countries included countries with three or more cellular licenses or greater than 50,000 mobile subscribers. In order to achieve a more balanced geographical representation, some of these countries were not included in the survey. In addition, some countries which were not included in the original screening, but which received an up-front payment for their license, were included in order to obtain a better understanding of the pricing of licenses. Chart #1 displays the US\$ price per POP paid for various cellular and PCS licenses. (A direct country to country comparison is not warranted since the size of the frequencies is not taken into account.)

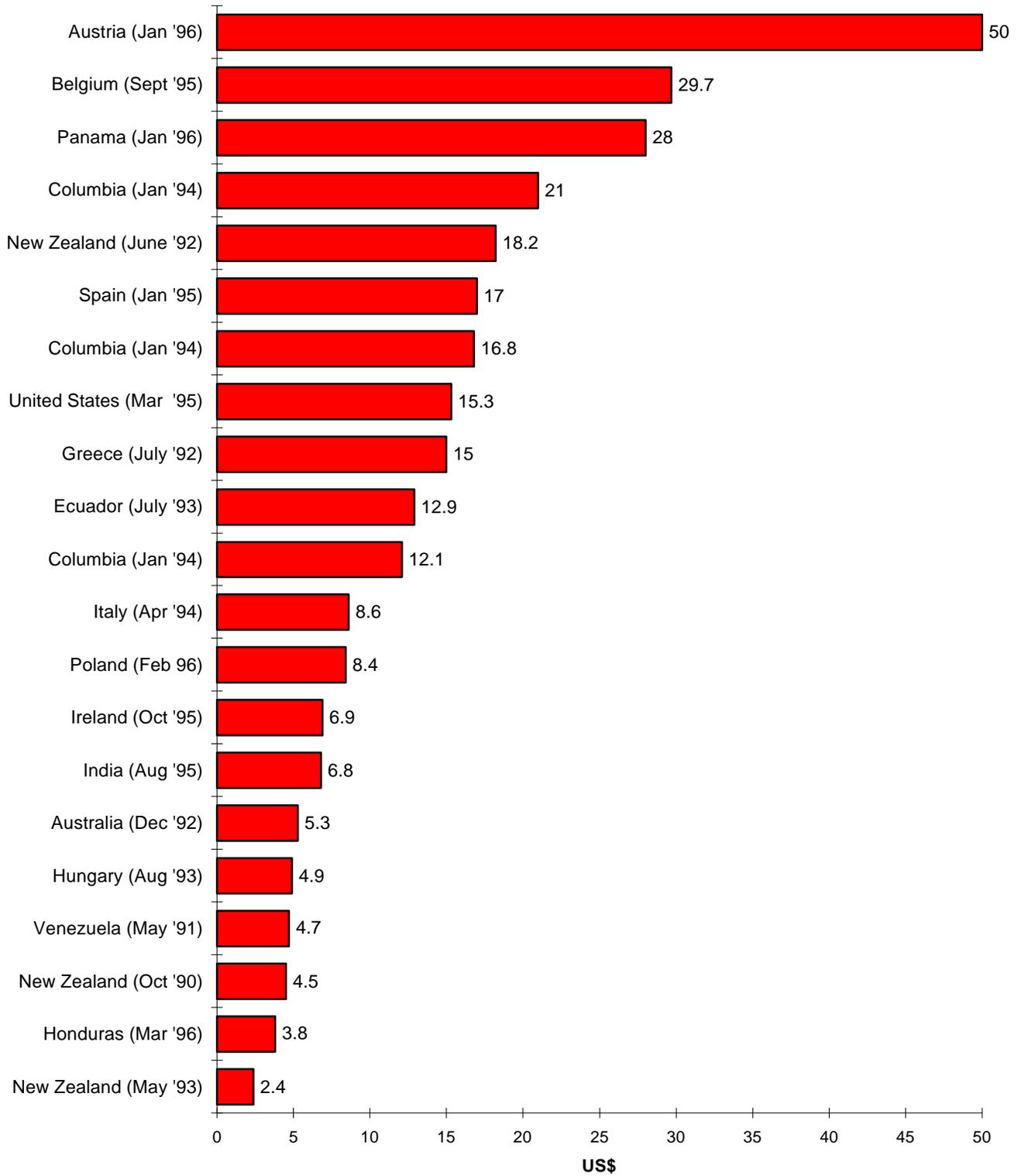
III. **Assignment Methodology**

1. **U.S. Auction Methodology**

The United States has the most developed auction methodology and the most experience using auctions to assign radio spectrum in the world. In the Omnibus Budget Reconciliation Act of 1993, Congress authorized the FCC to use competitive bidding procedures to award certain electromagnetic spectrum licenses. The FCC used a simultaneous multiple round auction for its first spectrum auction of Narrowband Personal Communications Services (Narrowband PCS) beginning on July 25, 1994 and an oral outcry design in its auction of Interactive Video and Data Service (IVDS) licenses beginning on July 28, 1994. Subsequent auctions have included: Regional Narrowband PCS (6 licenses in five regions), MTA Broadband PCS A & B (99 licenses)

and C (493 licenses-BTA), Direct Broadcast Satellite

Price per POP



(2 licenses), Multichannel Distribution Service (493 licenses), and 900 MHz Specialized Mobile Radio (1020 licenses).

Congress' authorization and the FCC's subsequent rulemakings indicate these institutions' strong faith in auctions to assign licenses fairly and efficiently. This faith in a market-based mechanism has been a key element in the success of this series of auctions. A similar faith is rarely observed in the institutions that control spectrum policy in other countries. Those government officials and regulatory institutions believe that their oversight and judgment in determining the license winners is critical to ensuring a "fair" outcome.

Auction theory assumes the existence of well developed and efficient legal systems and financial markets. The deliberative rulemaking process at the FCC limits substantive rule changes without providing an opportunity for public comment. U.S. financial markets enable individuals or corporations with sound business plans and superior talent to obtain financing at competitive terms. These underlying factors have contributed to the success of the FCC auctions by facilitating widespread participation by both large and small businesses.

Several other countries have used auctions to assign licenses, but none have used the simultaneous multiple round design that the FCC has used. In simultaneous multiple round auctions, all interdependent licenses are put up for bid at the same time, and bidders have an opportunity to bid on as many licenses as they desire in successive discrete bidding rounds. Bidding generally remains open on all licenses until there are no new valid bids on any of the licenses being auctioned. Activity rules are used to ensure that bidders do not hold back from bidding until they see what values other bidders place on the licenses. In this regard, simultaneous multiple round auctions generate the maximum amount of information for bidders concerning license values and facilitate the award of the licenses to the bidder(s) who value them most highly. In addition, the multi-round design enables bidders to pursue efficiency enhancing back-up bidding strategies as more information becomes available about license values.

Simultaneous multiple round auctions are conducted electronically using an automated auction software program. Bidders may place their bids from remote locations either via computer or telephonically. In this regard, bidders are provided with maximum flexibility to place bids from their offices without being forced to remain in Washington for the duration of the

auction.

2. Auctions in other countries

The auctions in other countries have been much simpler. Generally, the auctions have been limited to a single round in which all the participants submit a sealed bid. The design component that varies the most among the examples below is the method of determining the amount that the winning bidder must pay the national treasury. Some countries required the winning bidder to pay its bid, while others only required it to pay the bid of the second highest bidder. Other countries required that the second highest bidder match the highest bid if it wanted to obtain the second equivalent license. Below are more detailed descriptions of particular assignments.

India - In August 1995, India held an auction for two GSM licenses in each of 20 regions ("circles"). The rules allowed consortia to bid in any and all of the regions. The highest bidder won the first license in each region and had to pay the amount it bid in an up-front payment and subsequent annual payments. The second highest bidder had to match the highest bidder if it wanted to receive the second license. If it declined, the right to the second license fell to the third highest bidder, which had to match the highest bidder in order to receive the license. If no bidder matched the highest bid, then the second license would be re-auctioned.

Columbia - In January 1994, Columbia auctioned a second cellular license in each of three regions. The rules allowed consortia to bid in all of the regions. In a simultaneous single round auction, the highest bidder in a region won the license. The first licensee in each region was then required to pay 95% of the total amount bid by the second licensee.

New Zealand - In June 1990, New Zealand auctioned three new cellular licenses simultaneously using a sealed bid. It used a second price sealed-tender auction, which meant that the highest bidder won the license, but only paid the amount bid by the second highest bidder. This meant that one winner bid NZ\$101 million, but only paid NZ\$11 million.

Greece - In July 1992, Greece auctioned two national GSM licenses. Participants submitted a single bid for one of the licenses and the highest bidder won the first license. The rules stated that if the second highest bidder was within 10% of the highest bid, then it had the sole right to match the highest bid. If it decided not to match the highest bid, then it and the remaining participants could participate in another round of bidding for the second license. The second highest bidder actually bid 91% of the highest bid and elected to match the highest bid, thus winning the second license.

Panama - In January 1996, Panama held a single round auction for a national cellular license in which the highest bidder received the license. The Panamanian authorities pre-qualified applicants based on technical, financial and business criteria before allowing them to submit a single financial bid at a public bid-revealing event. The highest bidder won the license.

3. Auction Theory and Design

The above examples represent several different designs within the category of single round sealed bid auctions. The design used in the United States is an ascending bid or multiple-round auction. Single round sealed bid auctions generally raise less revenue, lead to complicated bidding strategies, produce inefficient outcomes, and pose winner's curse problems (bidder feeling they overbid)¹. When there are value interdependencies because of the possibility of geographic aggregation, such as in India and Columbia, a sequential auction is a poor design because bidders must forecast future prices to bid sensibly, thus complicating the bidding process. Some of the same problems exist when the auction is simultaneous and single round, as was the case in India and Columbia. The outcome is often inefficient and increases the probability of regret by the winning bidders. According to Peter Cramton, the simultaneous multiple round auction is the best practical design because it minimizes winner's curse, or bidder regret, allows bidders to pursue backup strategies as prices change, requires relatively simple bidding strategies, and offers the

¹ Cramton, Peter Digital Wireless Communications: Spectrum Auction Process Conference sponsored by USAID, Grand Hotel Kempinski, Budapest, Hungary April 19020, 1995.

best chance for efficient allocation². Paul Milgrom stresses that the decision to use an auction must be followed by careful rule design³. Some of the more important rules include activity rules, minimum bid increments, reserve prices, and bidder credits for favored groups. Improper rule design is often the reason for sub-optimal auction outcomes.

4. History of Assignment Practices

The FCC awarded the first cellular licenses to consortia of wireline providers. It assigned the second using comparative hearings, and later, lotteries. In a comparative hearing, two or more parties interested in a license would begin with a paper hearing without a judge, but would sometimes end up litigating before an administrative law judge. Applying a complex set of criteria, the judge would determine which applicant would best serve the public interest. Such decisions were often appealed to the full Commission, and in some cases, to the U.S. Court of Appeals, with the process often taking years. This process is similar to the way many countries, especially in Europe, assigned their licenses in the 1980s and early 1990s. The state-owned PTT almost always received the first analog cellular license (see Table 1). Sometimes a second analog license would be assigned using a comparative process similar to the comparative hearings in the U.S., but almost always behind closed doors, and with a limited appeal process (see Table 2).

The U.S. also used lotteries to assign some of the later cellular licenses. FCC lotteries were conducted similar to state-run lotteries, with each applicant being assigned a certain number and the winner being determined by random selection. The lottery process fueled speculation in FCC licenses and in many cases the license winner realized a windfall by selling their license in after-market transactions. This process delayed the initiation of service to the public and deprived the public the value of the spectrum.

The next wave of licensing involved services using digital-based wireless technology (GSM, PCS/PCN, PHS). In many countries, the state-owned PTT received the first GSM license (see

² Ibid.

³ Milgrom, Paul Auction Theory for Privatization, Chapter 1:
Auctioning the Radio Spectrum Forthcoming from Cambridge
University Press

Table 3). Since the awarding of their first GSM license, many countries have begun to liberalize their telecommunications market, usually introducing competition in the wireless sector first. Countries received numerous applications for their second GSM licenses, making the decision process more difficult than earlier assignments. Many countries began to add a financial bid to the list of selection criteria for their second digital license (see Table 4), while other countries continued with traditional comparative methods (see Table 5). The financial bid often simplified the decision process for many assigning authorities because of its significant weight in the selection criteria and its very objective nature. Despite the increasing use of financial bids, some countries have not introduced a financial component into their assignment process (see Table 6).

Countries often chose to use a comparative tender instead of an auction, because they believe that a tender is able to incorporate certain social goals that an auction is not able to incorporate. This fact can be observed in many tender documents that state the importance of job creation, low tariffs to end users, and investment. A tender also allows individual bidders to offer tradeoffs between cash and these other objectives. Although an auction doesn't explicitly compare bidders on these social goals, it can still fulfill them if the government creates a competitive environment. Competition reduces tariffs, spurs investment in new infrastructure, and creates new jobs as the industry grows. Hong Kong and Sweden provide excellent examples of the benefits of competition. Any bid applicant can promise to satisfy certain social and business goals, but the government then faces the task of ensuring that the winner actually fulfills the goals it claimed it would meet. A well-designed auction will assign a license to the entity which values the license most highly. In a competitive market, that winner must recoup the money it puts on the table. In fulfilling its own goals, that licensee will also be fulfilling the larger social goals of the assigning authority.

First Analog License Assigned
to PTT/Wireline Carrier

Australia	Israel	Poland
Austria	Italy	Spain
Belgium	Japan	Sweden
France	Korea	United Kingdom
Germany	Mexico	United States
Ireland	New Zealand	Venezuela

Second Analog Assigned
using Competitive Process

France	Sweden
Japan	United Kingdom
New Zealand	United States

First Digital License Assigned
to PTT/Wireline Carrier

Australia	Ireland
Austria	Italy
Belgium	Korea
France	Spain
Germany	Sweden
Hong Kong	

Countries Using Financial Bids
for Second Digital Licenses

Australia	Italy
Austria	New Zealand
Belgium	Poland
Ireland	Spain

Table 4

Countries Not Using Financial Bids
for Second Digital Licenses

France (& PCN)	Korea
Germany (& PCN)	Sweden
Hong Kong (& more)	United Kingdom

Table 5

Countries Never Having
Included a Financial Bid

Canada	Japan
France	Sweden
Germany	United Kingdom

Table 6

5. Liberalization of Telecommunications Sectors

The last several years have witnessed increasing liberalization and competition in telecommunication sectors around the world. In recognition of the importance of a dynamic regional telecommunications sector, the European Union has mandated that its members introduce competition into the provision of telecommunication services by 1998. Other countries in Latin America and Asia are also opening their markets to more competition. Many countries have begun this process with the wireless sector, which offers strong growth opportunities for private companies and lacks the universal service requirements of wireline service. The attractiveness of the wireless sector generates a considerable number of applications for a new license tender.

As the number of applicants increase, the comparative tender process, which establishes selection criteria in order to determine which applicant would most satisfy the public interest, becomes less efficient and more subject to dispute. Hungary introduced a financial bid element to its tender for two GSM licenses after it couldn't decide among several qualified applicants. Other countries include a financial bid in the initial tender documents and give it a significant percentage in the weighting mechanism. Use of a financial bid simplifies the decision-making process for an assigning authority, because it is an objective factor and is less susceptible to controversy in post-assignment disputes.

Over half of the recent license assignments have involved a financial component. The success of auctions in the U.S. and the large financial bids for licenses in countries such as Columbia, Greece, and Austria have encouraged many telecommunications ministers to reevaluate their assignment methods. The increasing trend to use financial bids has led many industry participants to accept that they will have to pay for any future licenses they win.

Liberalization of the telecommunications sector will compound the difficulty a country has selecting among applicants for licenses. For this and other reasons, several countries have already indicated that they will probably use auctions to assign their next set of licenses. These include Mexico, the Netherlands, Taiwan, Chile, Argentina, and Brazil.

IV. Case Studies

1. How to define success?

Some countries have achieved greater success with their assignment process than others, but how exactly should one define success in an endeavor which varies considerably across countries? The success of a particular country's assignment method depends, at one level, on the goals set out by that country. Since the goals differ between countries, a more general set of criteria is needed to judge the success or failure of a particular assignment when comparing it to other assignments around the world.

The U.S. uses a market-based assignment method, but its goals, and thus its definition of success, do not diverge significantly from the goals indicated by many other countries. The FCC's main goals are rapid assignment, assignment to parties that value the license most highly, ensuring equitable distribution of license benefits, maximizing the total benefits to the public of services provided with licenses net of licensing costs, fostering efficient spectrum use, and increasing competition with existing services.

Unfortunately, testing the achievement of these goals in license assignments around the world is difficult because of their broad and general nature. A condensed set of goals, that applies more appropriately to a cross-country analysis characterized by dissimilar assignment processes, include rapid assignment, rapid launch of service, participant satisfaction, appropriate compensation for public resource, and creation of a dynamic wireless sector. This survey uses these criteria of success to judge the success of an assignment. A successful assignment exemplifies several of the above characteristics, but not necessarily all of them. A less successful assignment might have some of the above characteristics, but the significant absence of one or several of them limits the success of the assignment.

2. Case Study Descriptions

United States

In the United States, the FCC assigned 99 Broadband PCS licenses in 51 Major Trading Areas using a simultaneous multi-round auction which began December 5, 1994 and ended March

13, 1995. Thirty bidders qualified to bid in the auction and seventeen paid for licenses that brought in over \$7 billion to the U.S. Treasury. Bidders had no serious complaints with the assignment method, and most found it much better than previous assignment methods because of its speed and fairness. The FCC educated the bidders on the auction process and in general made the entire process as transparent as possible. The simultaneous multi-round design of the auction, including sub-national licensing, and the attention to detail on the rule-makings, which ensured transparency and increased participant confidence in the system, contributed to the success of the A- and B-block assignments.

Columbia

The government of Columbia awarded three regional cellular licenses in March 1994, after a technical and financial screening process and a simultaneous single round auction in December 1993. The government raised over \$1 billion dollars for its treasury. One license in each region had already been assigned to the wireline carrier in the region and its foreign partner. The government required this first licensee to pay 95% of the bid of the second licensee. One consortia won licenses in two of the three regions and initiated service within three months of receiving the licenses. Sub-national licensing allowed bidders to value the regions separately, but the single round design of the auction didn't allow bidders to change their aggregation strategies during the auction based on the bids of the other bidders. A simultaneous single round auction of multiple regions doesn't provide as much information as a multiple round auction and, in addition, makes bidders face the risk of winning more than they want. The tender rules encouraged wide participation by allowing significant foreign ownership in a country where domestic capital was less abundant than in more developed markets.

Belgium

In Belgium, the Ministry of Communications awarded a second GSM license in September 1995 after conducting a competitive tender which had several weighted selection criteria: a license fee (49%), proposed customer tariffs (31%) and quality of service (20%). Five large international consortia submitted bids for the license. The only major complaints came from the existing GSM

licensee, which the European Court of Justice ordered to pay the same license fee for the license it had received for free in 1991. The process was rapid, lasting only five months from the date the tender documents were made public to the date the winner received the license. In addition, the publicly-disclosed weighted point system and the allowance for significant foreign participation encouraged a significant number of participants to submit bids and limited the number of complaints about the transparency of the process. Had the Belgian authorities allowed more time to prepare for the tender, they could have determined the terms and conditions of the license before the assignment, rather than negotiate them afterwards with the winner. All participants would have been bidding on the same terms and conditions, rather than creating their own assumptions in their bids.

Hong Kong

In early 1992, Hong Kong allocated four new digital licenses. It assigned the first three to the existing analog network operators and held a competitive tender for the fourth. The absence of foreign ownership restrictions encouraged eight consortia to submit proposals. The five politically well-connected consortia that made the short list were all strong financially and technically. The Postmaster General's office selected a winner after an intense period of scrutiny, but it did not use a financial component to help distinguish among the bidders. Today the level of mobile telephone penetration is over 11 percent. The fact that Hong Kong assigned a fourth license in order to stimulate competition is one reason for the high penetration today.

United Kingdom

Oftel was one of the first regulatory agencies to award PCN licenses in 1989. It believed competition between Cellnet and Vodafone in the analog market was the key factor in the high penetration rate of analog cell phones, and wanted to repeat this success by awarding three new PCN licenses. Oftel used a comparative tender process with no financial component to decide among the eight international consortia. Had Oftel used a financial component or allocated regional licenses, it might not have been asked by two of the winners permission to merge in 1992. A financial component might have led Oftel to select licensees who could have better

survived in a competitive market. The early assignment of multiple PCN licenses and the creation of competition with the existing cellular operators contributed to a dynamic wireless communications sector in the United Kingdom.

India

In India, the Department of Telecommunications (DoT) used a single-round auction to assign two licenses in each of twenty regions in August 1995. Over thirty international consortia participated in the auction. While one consortia bid in 18 of the regions most bidders limited their bids to only a few regions. The wealthier regions received the highest number of bids, while some poorer regions didn't receive any. Initially, the DoT allowed the consortia to win an unlimited number of licenses, but after the winners had been announced, the DoT modified this rule to restrict ownership in the more desired regions to three licenses. The absence of winners for some regions and the changing ownership of some licenses delayed the award of many licenses until late 1995. Had the auction been multiple round instead of single round, participants would have been able to pursue aggregation strategies more effectively. Given the single round design, participants had only one chance to obtain the regions they desired. Despite this design flaw, an assignment method other than an auction would have been exceptionally burdensome on the DoT because of the difficulty in selecting two winners in each of twenty regions from over thirty participants. The fact that the DoT forced license winners to divest some of their licenses, that some regions didn't receive bids, and that the DoT took several months to award licenses after announcing the winners detracted from the success of this assignment.

New Zealand

In June 1990, the New Zealand government chose an auction assignment method in order to ensure a rapid and efficient assignment of three cellular licenses, but lack of foresight and planning led to long delays and lower than expected revenues. The main problem with the auction rules was that they allowed the current cellular operator, Telecom New Zealand (TCNZ) to participate in the bidding for all three new licenses. Also, the failure to provide a successful general interconnection regime diminished the appetite and raised the risk factor associated with pursuing

new licenses. After the government reviewed the results, it ruled that TCNZ's ownership of two of the three new licenses would hinder the development of a fair competitive sector. In addition, the choice of a second price sealed-tender auction reduced total revenue and created additional contentious issues to address during the legal proceedings which followed the auction. The government awarded one of the licenses soon after the auction, but it didn't award the other two until June 1992 and May 1993. The winner of the last license assigned has yet to offer service.

Ireland

In Ireland, the Ministry of Energy, Transport and Communication wanted to use an auction to assign the second GSM license, but the European Commission forced it to limit the amount of the financial bid to \$24 million. The Ministry then decided to include other selection criteria such as roll-out time line, tariff regimes, customer benefits, and employment opportunities. Although several major international companies participated, the Ministry awarded the license to a little-known consortia. The disappointment of the other participants was magnified by the government's refusal to divulge its decision methodology after the license award. One losing consortia appealed the Irish government's decision to the European Commission. The many dissatisfied participants and the lack of transparency in the government's decision making process are signs of the limited success of this assignment. Had the government allowed bidders to express their interest with a financial bid and improved the transparency of the entire process, it would have achieved greater success.

Canada

Industry Canada assigned two national 30 MHz and two national 10 MHz PCS licenses in December 1995 using a comparative tender process consisting of selection criteria that stressed goals such as promoting job creation and investment, encouraging technological innovation, and promoting competition. Although it had indicated the desire initially to assign three licenses of each bandwidth, Industry Canada kept one license of each bandwidth in reserve. Several of the fifteen consortia submitting proposals requested regional licenses, but Industry Canada declined these proposals claiming that they were not adequate and that the market couldn't sustain three

new competitors of the same bandwidth. Four separate consortia received licenses, including the two current cellular providers, each receiving one of the 10 MHz licenses. The fact that regional licensing couldn't be accommodated and that participants eager to receive the third license of each bandwidth were not accommodated because Industry Canada kept spectrum in reserve detracted from the success of this assignment. A major factor limiting the success of this assignment was the lack of commitment Industry Canada made to participants regarding the assignment of a third license in each bandwidth and the assignment of regional licenses. Since bidders didn't know for sure if there would be regional licenses, there was not the incentive to create elaborate business plans for regional licenses.

France

The French government assigned a single national PCN license using a comparative tender in October 1994. It limited non-European ownership to 20% of the shares of a participating consortium, which led to only three international consortia participating in the tender. Despite the efforts of the General Directorate of Posts and Telecommunications (DGPT) to make the assignment process transparent, the fact that senior politicians became involved in the selection process in the closing weeks led to the appearance that the final decision was influenced by political considerations. The selection criteria cited in a Ministry publication after the award included the stability of the consortium, likelihood to create competition with the existing cellular operators, creation of French jobs, speed of network roll-out, mobile network operating experience, and realistic business plan and financing options. The major factors limiting success included last minute political involvement, limiting participation mainly to French and European firms, and allocating too few licenses.

V. Factors of success across countries

The case studies above indicate the factors that led to successful assignments, or the lack of certain factors that led to less successful assignments. These factors are associated with both the assignment method and the allocation process.

The more an assignment method emphasizes objective criteria, such as financial bids, the more transparent the decision-making process will be. Wide participation, encouraged by broad eligibility, is more easily managed by assigning authorities if clear, undisputable criteria dominate the decision-making process. Sub-national licensing offers more bidders the opportunity to participate in licensing, while allowing those bidders to pursue aggregation strategies for certain types of licenses. Smaller countries benefit less than larger countries, because of the potential inefficiencies in operating small networks and the transaction costs of assigning numerous sub-national licenses. Concurrent assignment of similar licenses refers to the assignment of two similar licenses, such as two GSM or two PCS, concurrently rather than separated by a year or more. Concurrent assignments may lead to better outcomes because no license winner has the advantage of time. Clear rights & responsibilities refers to the general credibility of the assignment process and its rules. If the rules change without notice, then the process begins to lose credibility with the participants and the outcome suffers. The number of similar licenses refers to the total number of the same type (GSM, PCS) that are assigned. In general, more licenses are better than fewer.

The summaries below indicate the assignments that benefited from a particular factor and the assignments that lacked that factor.

Transparency

Transparency refers to the decision-making process itself, whether it is based on a financial bid or other selection criteria. After pre-qualifying the participants, the U.S. and Columbia successfully used financial bids as the single criteria to select winners. Belgium indicated the exact percentage weight of three criteria, thus limiting the potential for disputes after a decision had been made. Meanwhile, the use of comparative tenders with subjective criteria left the assigning authorities in Ireland, Canada and France subject to appeals and formal complaints after the award of their licenses.

Wide Qualified Participation

The use of auctions facilitated the processing of the applications in the U.S. (30 bidders)

and Columbia (7). In Belgium (5), a strict weighting of selection criteria disciplined the Ministry to focus on certain key areas of the proposals. Hong Kong (8) and the U.K. (8) used comparative tenders, but the large number of bidders in each case ensured that they would be able to choose the best proposals. France limited participation to mainly European firms and received only three proposals. Telecom New Zealand dominated the process because there was only one other consortia, Bell South, which had the financial capability to compete.

Sub-National Licensing

The use of regional licensing in the United States and Columbia allowed bidders to make distinctions between regions, both in terms of their aggregation strategies and in terms of price. This greater flexibility for bidders contributed to the successful outcomes for these particular types of licenses. France and Canada have enough land mass and population that regional licensing could have proved an effective means of assigning licenses. Had India chosen to use any method other than auctions, the processing of over thirty consortia bidding for three to eighteen regional licenses each would have been daunting for the Department of Telecommunications. Had it chosen to use a multiple round design, though, bidders would have been able to pursue regional aggregation strategies more effectively.

Concurrent assignment of similar licenses

The U.S. assigned the A & B block PCS licenses concurrently, followed within a year by the C block licenses. Columbia awarded the first cellular license to the regional wireline operators, and shortly thereafter the second cellular license to competitive bidders. Hong Kong assigned three GSM licenses to the existing analog cellular providers followed quickly by the fourth to a new entrant. In all three cases, no one competitor had a significant time advantage over the others. France assigned only one PCS license at a time when other countries were allocating up to six. One would assume that France will assign more PCS licenses at a future date. Ireland assigned the first GSM license to the state-owned PTT in the early 1990s, but only awarded the second in late 1995, thus creating a significant advantage for the incumbent.

Clear rights & responsibilities

The rule-making process in the United States allows comments and requests for clarification by industry participants. This dialog between industry and the FCC ensures that there will be no sudden unexpected change in the rules and gives participants greater confidence in the system. India changed the ownership rules, thus forcing some winners of the regional licenses to sell their licenses, disrupting regional bidding strategies. New Zealand's failure to establish ownership limitations before the assignment of three new licenses in 1990 led to a result that the assigning authorities believed was not in the public's best interest. Two years of legal proceedings finally settled the matter.

Number of similar licenses

The U.S. allocated three sets of 30 MHz PCS regional licenses and three sets of 10 MHz PCS regional licenses. Hong Kong allocated four GSM licenses. Both countries expect competition to satisfy other social goals. France, attempting to satisfy social goals in the selection process, chose to allocate only one new PCN license.

VI. U.S. Incorporation of Success Factors

The assignment and allocation process for the six PCS licenses incorporates all of the successful factors identified in other assignments around the world.

Transparency - Auctions are a very transparent process of selecting license winners, because the final decision is based on a set of financial bids. The selection of the highest bid is not at all arbitrary. This change from past assignment practices has attracted more qualified applicants and limited the number of appeals after the award of licenses.

Wide Qualified Participation - Since wider participation ensures a better pool of candidates than limited participation, the use of auctions as a means to handle that larger pool ensures that the U.S. will continue to benefit by wide participation. The auctions were a very efficient means of handling the thirty bidders for the A & B block licenses, compared with comparative hearings.

The power of auctions to handle even more bidders became obvious in the assignment of 493 C-block licenses in early 1996.

Sub-national licensing - Simultaneous multiple round auctions facilitate sub-national licensing because bidders are able to pursue aggregation and back-up bidding strategies which take into account the bidding strategies of other bidders.

Concurrent assignment of similar licenses- The FCC's spectrum policy stresses the importance of assigning similar licenses concurrently in a multiple round (ascending bid) auction. Unforeseen legal challenges on C-block licenses delayed their assignment after the auctioning of the A- and B-block licenses. The D-, E- and F-block licenses are all being assigned concurrently.

Clear rights & responsibilities- The rule-making process at the FCC encourages public discussion of current and upcoming policy. Industry has an opportunity to request clarification or seek reconsideration on particular rule-makings. This process ensures that the adopted rules are clear and applicable to the real world situation.

Number of licenses - The FCC's policy is to make large amounts of spectrum available to the private sector to promote competition in the provision of wireless services. Current plans call for up to potentially eight competitors in each market: the two original cellular licenses, and the six PCS licenses (A-F).

VII. Auction benefits most evident under certain conditions

Auctions have worked well to assign mutually exclusive PCS licenses, and should work well to assign future mutually exclusive licenses in the U.S.. There are several underlying characteristics of American society that make auctions particularly effective. These are:

- 1) Credible rules enforced by credible laws
- 2) Well developed financial markets

3) No supranationally imposed restrictions

In countries without a well developed regulatory body and legal system that create and enforce credible rules, potential bidders will be less likely to participate or to offer high bids because of their lack of confidence in the government's ability to uphold the terms of the license agreements. In India, the absence of a well-developed regulatory body at the time of the GSM license assignments in the four major cities meant that applicants used the slow-moving courts to achieve a fairer outcome. In Poland, a legal agreement between the Polish state and the winner of the first cellular license, Centertel, was not upheld by the Polish government at the time of the GSM licensing. Although the two GSM licenses have been assigned, Centertel is still appealing the government's decision not to award it one of the licenses. The winners of the two licenses might see the terms of their licenses modified if Centertel is successful.

The United States has one of the most advanced financial markets in the world. Sources of capital, from large commercial banks to small venture capital firms, allocate money to large, medium, and small companies based on the level of risk involved. This system ensures that there will be many participants in the FCC license assignments. Countries with less developed capital markets will not be able to attract the large number of domestic bidders the U.S. has been able to attract. As mentioned earlier, the more bidders that participate, the more likely an assignment will be successful. In the Polish assignment of two GSM licenses, the lack of local firms with enough capital to form consortia with foreign firms limited the number of participants to three. Even though world capital markets are more developed than ever, the lack of well developed domestic capital markets in some countries will limit the number of local participants unless foreign ownership restrictions are reduced. A country must also be aware of both domestic and foreign companies who might be able to cross-subsidize their investment in a wireless license. In the Austrian assignment of the second GSM license, the Deutsche Telekom consortium bid two to three times as much as the other consortia. Other bidders noted that Deutsche Telekom's management is not subject to the same financial scrutiny by shareholders that they are subject to, thus enabling Deutsche Telekom to make a bid significantly above what they considered to be reasonable.

The U.S. retains autonomy over its spectrum and license allocation process, but the member countries of the European Union do not. Several have attempted to use auctions or tenders with large financial components to assign licenses, but have been subjected to the scrutiny and judgement of the European Commission. Ireland initially wanted to use an auction to assign its second GSM license, but the EC forced it to scale back the financial component of the tender to a maximum bid of \$24 million. Italy, Belgium, Spain and Austria all received large license fees from the winners of their second GSM tenders, but have been forced by the EC to charge the first GSM licensee the same amount, to return the license fee, or to adjust interconnection agreements to level the competitive playing field for the second licensee.

VIII. **Conclusion**

This paper has attempted to increase the Commission's understanding of how other countries assign cellular and PCS licenses and to compare those assignment methods with the U.S. auction methodology. Most countries continue to use competitive tenders in which a government body makes a decision based on a set of selection criteria. In the past two years, an increasing number of countries have added financial bids to the list of selection criteria, and a handful of countries have used single round auctions. The Commission's simultaneous multiple round auction design, which has evolved over the last two years, represents the most advanced auction design in use today. The decision to use this novel approach was taken during a time when the President of the United States was stressing the importance of reinventing government and the Chairman of the Commission was willing to take a few risks to ensure that the new procedures were implemented properly and thoroughly. Between the Omnibus Budget Reconciliation Act of August 1993 and the first auction in July 1994, Commission staff worked long hours to implement the assignment and service rules, design the auction, and create the information technology which have made the auctions possible. The confluence of the three factors above made the auctions a success.

This study of the assignment methods in other countries provides lessons for improving the Commission's own assignment practices. The paper outlines the main factors which have contributed to successful assignments around the world. These include transparency of the

decision-making process, wide participation by bidders/applicants, sub-national licensing when regional licenses are appropriate, concurrent assignment of similar licenses when possible, clear rights & responsibilities in the tender documents and license agreements, and assigning a large number of licenses. Although all successful assignments discussed in this paper do not have all of these characteristics, they have enough of them to be successful. The less successful assignments have relatively few of these characteristics or are missing critical characteristics for the conditions of that assignment.

Although the Commission's current assignment policy encompasses all of these success factors, the Commission should not forget these factors as it continues to modify its assignment method. One of the greatest strengths of the current assignment process is the willingness of the Commission to allow the rules to evolve in response to the rule making process that encourages comments by affected parties. The first auctions and assignment rules had minor design flaws which were corrected for subsequent auctions. By ensuring logical frequency allocation, open qualified participation, and transparency of the rule making process, the FCC will continue to remain a leader in spectrum assignment and allocation policy.

References

- Cramton, Peter C. "Money Out of Thin Air: The Nationwide Narrowband PCS Auction", *Journal of Economics & Management Strategy*, Vol. 4 No. 2, Summer 1995, pp. 267-341.
- Kwerel, Evan and Alex Felker, "Using Auctions to Select FCC Licenses", *OPP Working Paper Series*, No. 16 May 1985.
- McAfee, R. Preston and John McMillan, "Auctions and Bidding", *Journal of Economic Literature*, Vol XXV (June 1987), pp 699-739.
- McMillan, John "Selling Spectrum Rights", *Journal of Economic Perspectives*, Vol. 8, No. 3, Summer 1994, pp 145-162.
- Milgrom, Paul "Auctions and Bidding: A Primer", *Journal of Economic Perspectives*, Vol. 3 No. 3, Summer 1989, pp 3-22.
- Milgrom, Paul *Auction Theory for Privatization* Chapter 1: Auctioning the Radio Spectrum, Forthcoming from Cambridge University Press

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