



Optimal Policy Relative to Spectrum Auction

Marcel Boyer, Ph.D.

Vice President and Chief Economist, Montreal Economic Institute
Bell Canada Professor of Industrial Economics, University of Montreal

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1. Introduction

The impending release of additional spectrum for advanced wireless services (AWS) use in the 2 GHz range raises a host of questions concerning regulatory and competitive oversight of the Canadian wireless industry. Recent policies have contributed to greater flexibility in the wireless market including the abolition of the spectrum cap policy, and the removal of the Canadian Radio-television and Telecommunications Commission from mobile and wireless services as a consumer rate regulator. The Canadian mobile telephone industry is largely consolidated, consisting of three national carriers, several regional carriers, and more recently, mobile virtual network operators (MVNOs). Spectrum is only periodically available, and is also subject to technical standards and to international and national allocation plans. Spectrum is a finite resource, which in itself restricts the total number of carriers in the marketplace.

Currently, Industry Canada plans to auction paired bands of spectrum as blocks in the 2 GHz range, with the goal of facilitating AWS adoption. The auction mechanism for telecommunications services has been used in many OECD countries, including Canada during the 2004 auction of the 2300 MHz and 3500 MHz bands.¹ It is rightly considered an economically efficient way to allocate this scarce resource. The Canadian government is also paying careful attention to the design of the auction as it impacts the societal benefits of spectrum allocation in the Canadian economy. Key considerations include market entry and competition, as well as the structure, term and implementation of the spectrum licences. More specifically, should Industry Canada take measures to facilitate market entry in the AWS spectrum auction? Should there be a certain amount of spectrum allocated to new entrants in the wireless industry? If so, how large a portion of the spectrum? What should the length of the licence term be? Should there be interim implementation requirements? Which provisions should be included for renewal of the licence?

¹ Industry Canada (2007), p.16

In this report, I argue that spectrum auctions are an efficient method of allocating wireless capacity. I discuss the competitive environment and the implications of auction design on the entry of newcomers in the wireless industry. Although the capital requirements and barriers to entry in the wireless industry are significant², the wireless industry may nonetheless be sufficiently competitive to allow entry of new innovative players with superior products. To this end, the government is best suited to the role of regulator balancing short run (static) and long run (dynamic) goals through competitive processes rather than base policy on the traditional measurement of market shares and concentration ratios. Such metrics do not adequately measure competitive pressures in this growing, technology-driven industry. If, however, additional measures are still deemed necessary to help new entrants penetrate the market, ex post benefits awarded only to successful new players would be more efficient than ex ante benefits, such as the currently proposed spectrum “set-aside”.

2. Spectrum Auctions

Spectrum auctions are a widely used method of allocating licences to firms in national wireless markets. Experience in OECD countries has shown that well-designed auctions are an efficient way to allocate licences to the parties that value them the most, while generating considerable revenues for the government.

The economic literature on auctions as a method of allocating spectrum resources is extensive and highly favourable.³ Alternatives, such as comparative selection procedures or administrative processes (oft-referred to as “beauty contests” in the literature) “were used and then rejected in the US”⁴ and have similarly ceded way to auctions in most OECD countries, particularly for the allocation of bandwidth compatible with the

² *Ibid* p.19

³ See, for example, Hazlett, Thomas (1998) “Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?” *Journal of Law and Economics* (41) or McMillan, John (1995), “Why Auction the Spectrum?” *Telecommunications Policy* (19).

⁴ Cramton (2002), p.3

development and rollout of third-generation (3G) technology. These alternatives will be discussed in the subsequent section.

The main advantage of auctions is their efficiency, with the companies with the highest value for the spectrum bidding the highest prices. Competition in auctions is not wasteful. Auction revenue does not result in the same type of welfare loss that occurs from increasing taxes. This welfare loss can be explained simply: when something is taxed, there is less of it. Taxes, as applied to productive activities such as income, manufacturing and investment increase the price of the activity beyond economic costs, thus reducing the quantity provided. Besides and above the transfer of resources from the taxpayers to the government, this reduction in productive activity wastes resources, misallocating the resources away from where they are most wanted, resulting in a “deadweight loss,” or a loss in welfare. Changing the type of tax is one alternative to a lower tax burden, and thus reducing the deadweight loss by other means. One of the most efficient ways of reducing this burden is to raise public revenue from a resource that exists only in fixed quantity. In this case, this resource is spectrum. The auction revenues are a type of “tax” that does not reduce the supply and does not increase prices. Therefore, auction revenues can be seen as offsetting distortions from taxation. Competition in auctions is also transparent, in that the outcome and the rationale for the outcome are visible to all players. That is, the method of assigning spectrum licences through auction is a process that can be observed by participants and non-participants alike, with the decision-making made through a transparent market mechanism.

2.1 Alternatives to Auctions

The alternatives to spectrum auctions include the previously mentioned comparative selection procedures, lotteries, and a hybrid form of the auction and comparative selection mechanisms. In lotteries, the licence winners are selected randomly from those that apply and qualify. As licences are very valuable, large numbers of companies apply, wasting resources in “creating and processing the applications.”⁵ The likelihood that

⁵ *Ibid*, p.4

lottery winners will have the capital, the plan and the products to ensure long-term viability in the market is equally left to chance.

The comparative selection method of allocating spectrum has the benefit of equity – in that it requires all participants “to submit the same information and the same criteria used to judge and weigh the relative merits of a submission.”⁶ Although expert review is expected to be non-discriminatory and objective, in practice, the final judgment is often subjective and lacking in transparency. Understandably, unsuccessful participants in the comparative selection process have a tendency to challenge the results in courts – as France Telecom did in Spain – a “natural reaction to the discretionary and subjective nature of comparative selection procedures.”⁷ This process is also administratively cumbersome, as there are costs associated with establishing proper evaluation criteria and the time and effort to review all applications, not to mention post-decision litigation costs.

This lack of transparency and the opportunity for corruption have in fact led some countries to modify the comparative selection method in favour of a hybrid approach. In Italy, the firms are first subject to a comparative selection procedure that then admits them to the second round - an auction. France uses the comparative selection process, but then charges the winners a high licensing fee.

2.2 Auction Design

Auction formats differ widely in design. The first choice is often between a sealed bid auction and an open auction. A sealed bid auction is defined as one that requires each participant to submit a bid separately, in a confidential manner (e.g. a sealed envelope). All of the bids are opened at the same time, and the seller is committed to delivering the good to the highest bidder. The winner pays the price written in their bid. An open auction format permits more transparency, as all auction participants bid continuously

⁶ OECD (2001), p.19

⁷ *Ibid*, p.23

during the same time-period, and observe each others' bids. In this sense, each bid in the open auction format reveals more information on the value of the spectrum licence. Each participating bidder can then condition their subsequent bid on this information.

Collusion, the major disadvantage of this format, may occur due to this transparency. For example, bidders can encode messages within bids, *signalling* another bidder in the auction by ending a bid with a certain numerical sequence. Ending a bid with "67" might translate to "I'll give you the Montréal licence if you give me the Ottawa one." This problem can be avoided by making bids anonymous and by rounding the numerical value of the last high bid, but other more sophisticated forms of collusion are still of concern. Generally, the economic literature endorses open bidding over sealed bids, as the informational advantage outweighs the risks of collusion.⁸

The sequencing of auctions is another key design decision best summarized as a choice between a simultaneous and a sequential auction format. Sequential open auctions are defined as auctions where licences are made available for sale in sequence. They force bidders to speculate on the outcome of future auctions. Bidders thus run the risk of buying too early at high prices – or regretting not having bought early enough at low prices. In a simultaneous open auction with multiple licences, all of the licences are auctioned at the same time, allowing bidders to switch licences and evaluate the prices in each round without having to anticipate where the prices in future auctions might go. With the increased amount of information available, competitive market prices are generated; a similar licence will sell for a similar price. Therefore, a simultaneous open auction is preferable for distributing multiple available spectrum licences, as it maximizes a bidder's flexibility vis-à-vis sequential auctions. Sequential open auctions are less flexible because they force bidders to anticipate or even guess where prices are likely to go. It is complex, and the chance of the outcomes maximizing the gains from exchange is far less likely than in simultaneous auctions. In the simultaneous auction, all bidders have the same information, and the bidders can bid on the licence for which they hold the highest value, not just the highest value contingent upon speculation about future

⁸ Cramton (2002), p.5

outcomes (as is the case in sequential auctions). In this sense, licences are allotted to those with the highest values for the licence, an efficient outcome at market prices.⁹

Simultaneous open auctions are not without their problems. The *exposure problem* may arise when complementarities differ between buyers; some buyers might have positive complementarities while others buyers have negative ones.¹⁰ For instance, an operator may need two licences in contiguous regions to have a viable business. Thus, during an auction that forces bidders to compete for individual licences, a bidder that needs the two contiguous licences to be profitable is thus “exposed” to the possibility that he may win one licence without winning the other complementary licence. Or, an operator may face decreasing marginal revenues per customer if he were to win two licences with negative complementarities. The existence of these positive and negative complementarities can lead to less aggressive bidding, or non-participation in the auction. When the same licences are substitutes for some bidders and complements for others, the effects of the exposure problem are most severe.¹¹ In this situation, some bidders will inevitably behave less aggressively than others, market prices generally do not exist (the prices are lower), and the outcome is inefficient.¹² Combinatorial or package bidding is one proposed solution to this problem. In this auction format, participating firms can place bids on groups of licences and on individual licences. This then “allows bidders to better express the value of any synergies (benefits from combining complementary items) that may exist among licenses and to avoid the risk of winning only part of a desired set.”¹³ The United States Federal Communications Commission has taken the lead in developing this strategy and has used it in limited circumstances.

Although this type of auction limits the exposure problem, it opens itself to an inversely related problem – the *threshold problem*. The threshold problem is a variant of the *free-rider problem*, where small buyers who are interested in small lots (quantities) may have an incentive to wait and observe the behaviour of other small buyers. If the other small

⁹ *Ibid*, p.6

¹⁰ OECD, p.41

¹¹ Milgrom, <http://wireless.fcc.gov/auctions/conferences/combin2000/releases/milgrom.pdf> p.10

¹² *Ibid*

¹³ http://wireless.fcc.gov/auctions/default.htm?job=about_auctions&page=2

buyers increase their offers, it will also help the “waiting” firm beat the offers of large buyers interested in large lots. In a simplified situation where two small buyers each want one licence that together form a block of licences desired by one large buyer, the two small buyers may be tempted to “wait-and-see” if the other small buyer moves first. This wait-and-see approach allows firms to “free-ride” on the activity of others.

To further illustrate this point, I will elaborate on the previous example. Large firm “X” covets two similar, complementary licences (licences 1 and 2), while two small firms, “A” and “B” desire licence 1 and licence 2 respectively. Firm X bids on the two licences as a package, while firm A continues to bid up the price of licence 1. Firm B chooses to “free-ride” – not bidding on licence 2, and waits until firm X has withdrawn its combined bid on 1 and 2. Meanwhile, the price of licence 1 is much higher than that of licence 2. Firm B has benefited from its own inaction, waiting until the combined price of 1 and 2 crossed a certain threshold, permitting it thus to purchase licence 2 at a non-market-clearing price. As the results from this simplified example indicate, the effects of this type of strategic behaviour may induce inefficiency and lower auction revenues.¹⁴ Given these problems, combinatorial auction design is still evolving. Still, the potential efficiency gains from synergies and complementarities are great. Canada considers this a promising avenue of research, but has yet to implement a combinatorial-type auction.¹⁵

2.3 Spectrum Auction Design in Canada

The proposed format for the impending AWS spectrum auction is the one that had already been used in the most recent Canadian spectrum auction, that is, a simultaneous multiple-round (SMR) auction. It is a variant of the simultaneous open auction. A simultaneous multiple-round auction places several licences up for sale at the same time; bidders are only allowed to bid on one licence at a time in a series of rounds. All licences are available for bidding throughout the auction, and the auction stops when no new bids

¹⁴ OECD, p.42

¹⁵ Industry Canada (2001), p.20

for any licence are submitted. Bid design may vary between countries. Industry Canada uses increment bidding (also known as “click-box” or “non-discretionary” bidding) for its spectrum auctions. Instead of entering a bid that exceeds the standing high bid by some pre-determined minimum bid increment, bidders have the choice of responding ‘Yes’ or ‘No’ to bid an exact amount equal to the standing high bid plus a predetermined bid increment established by Industry Canada.¹⁶ Prices increase gradually and do not “jump,” while the possibility of collusion through bid signalling with trailing digits in the bids is removed. Bidding is not continuous; there are successive rounds of bidding. In between each round, the results (the standing high bid) are made public, allowing the bidders to adjust their strategy as they see fit. If there is a tie for the standing high bid, Industry Canada uses either a random selection process or a time stamp rule to select one of the bidders as the standing high bidder for the next round. The increment rule can also be modified to allow bid increases in multiple increments, which can increase the speed of the auction process.

The expressed goals of the upcoming spectrum auction “is not to raise revenue, rather it is to award licences fairly, efficiently and effectively so as to ensure that the Canadian public derives the maximum possible benefit for the spectrum resource.”¹⁷ To this end, the Canadian government has enumerated certain competition principles to ensure the maximization of economic benefits.¹⁸ These “pro-competitive measures” may include restricting or disallowing the participation of certain firms in an auction and establishing limits on the amount of spectrum that any one firm can hold.¹⁹ In this case – the AWS spectrum auction – there have been no final decisions made as to set aside a certain part of spectrum for new players, or to restrict participation through spectrum limits or firm characteristics. The criteria used to evaluate this decision include multiple factors, which may include the current market structure, rivalry in the market, pricing, expressed

¹⁶ *Ibid*, p.15

¹⁷ [Industry](#) Canada (2002)

¹⁸ Industry Canada (2001), pp.2-3

¹⁹ *Ibid*

demand for the new spectrum made available, and the threat of incumbents precluding market entry by purchasing the entire available spectrum.²⁰

2.4 Spectrum Auction Design: International Experience

The discussion in this section will be limited to those countries that have used the auction mechanism to allocate spectrum compatible with 3G and other advanced wireless services. I will examine the recent experiences of the United Kingdom, the Netherlands, the United States and New Zealand.

The United Kingdom was the first country to auction spectrum for 3G technologies. After a long consultation period, the UK government determined that five licences (rather than four) could be made out of the available bandwidth. Companies were prohibited from acquiring more than one licence. As the current wireless market consisted of four incumbents, this structure guaranteed the entry of one new firm, and the possibility of more than one. The largest licence, at 2x15 MHz of paired spectrum plus 5 MHz of unpaired spectrum, was reserved for a new entrant. The United Kingdom felt this set-aside would “mitigate the disadvantages for a new entrant of not having other spectrum or an existing network.”²¹ There were no incumbency restrictions placed upon the four remaining licences. Of these four licences, one was nearly equal in size to the reserved licence (2x15 MHz of paired spectrum); the three others were smaller and roughly identical in size (2x10 MHz of paired spectrum plus 5 MHz of unpaired spectrum). The licence terms were for twenty years. The largest payment for a licence was paid by an incumbent for GBP £5.96 billion, the new entrant licence for £4.38 billion, and the three licences of equal size sold to the remaining three incumbents for slightly less, two at about £4.0 billion and the other at £4.09 billion.

Auction rules and licence design seem to have played a central role in the success of the auction. The UK followed the practice established in previous United States spectrum

²⁰ Industry Canada (2007), p.21

²¹ [Radiocommunications](#) Agency (1999)

auctions, using a transparent²² simultaneous multiple round format, and imposed a spectrum cap, prohibiting companies from acquiring more than one licence. Although the UK allowed for instalment payments, the terms were not attractive; all winning firms paid the licence fee upon auction conclusion. Activity rules were clear. To remain active, a firm had to either (1) bid in a round, (2) be the current price high bidder or (3) use one of their three waivers.²³ Most firms bid the minimum increment (5%) in each round and followed the natural strategy to bid until their reserve price was reached and to leave the auction once their reserve price was exceeded. Moreover, many of the potential new entrants dropped out of bidding at the licence price of £2.0 billion, giving a fairly clear indication of the reserve price for less-efficient operators.²⁴ It is important to keep in mind that there were no restrictions placed upon foreign ownership in the auction. Therefore, many of the potential “new” entrants were not particularly new to the telecom industry; they were just new to the UK domestic market. Furthermore, strategic partnerships can also allow the entry of competitive new firms.²⁵

The experience in the Netherlands is often contrasted against that of the UK. Following on the heels of the UK auction, the results fell far short of expectations. Similarly, five licences were made available, with terms of 15 years each. Following the advice of the Universal Mobile Telecommunications System (UMTS) Forum, the Netherlands decided to auction just five licences in a market that already had five incumbents. Compared to other European countries, such as the UK, there were as many domestic incumbents (five) as there were licences. New entrants were indeed allowed to participate in the auction, but the quantity of licences available were a likely deterrent to entry, as the new entrants figured that the incumbents were willing to pay more to get the available licences. Klemperer (2000) cites this as the “key blunder” in the auction. Only six companies decided to enter the auction, the five incumbents and the new entrant, Versatel. Before the auction began, the lack of well-defined regulatory policies allowed

²² Price bids, the use of waivers and bidder identities were made public at the end of each round, informing each bidder about the identities (and implicit interests) of the other bidders.

²³ Cramton (2001), p.3

²⁴ OECD, p.21

²⁵ France Telecom failed to win a spectrum licence in the 2000 UK 3G auction, but was able to gain entry in the market later that year by purchasing Orange Telecom.

stronger potential entrants to make deals with the incumbent operators. Versatel, generally considered a weaker firm, made no such deal and quit early in the auction. This paved the way for the incumbent companies to strategically use waivers to keep the licence prices low.

Waivers, when employed in the auction allow a bidder to “pass” on a round of bidding while keeping the required level of activity to remain in the auction. The excessive quantity of waivers and the rules for their usage led to a collusive bidding strategy where each firm took turns exercising the waiver, keeping the price at zero for four licences through five rounds. The dominant strategy in this case, obviously, was not to bid the value of the licence. Following Versatel’s exit, it became immediately clear that the licence auction prices were going to be sub-optimal (the final per-capita sale price was less than 30% of the UK auction). A major problem was the fact that the Dutch government had not built safeguards into the auction design, such as a governmental reserve price or the right to stop the auction at any time in the process, which might have had a different effect on the outcome.²⁶

The United States has long been a pioneer in the use of auctions for spectrum allocation. To date, the United States has used the auction mechanism over seventy-five times to allocate spectrum resources.²⁷ About 25% of these auctions represent bandwidth that was allocated or usable for voice-transmission technologies. The United States has experimented with different ex ante incentives to help minimize anti-competitive outcomes in the auction process. The four approaches employed include allowing instalment payments for designated entities, a spectrum cap, bidding credits and spectrum set-aside. The first approach, attempted in the 1996 C block auction, allowed overly attractive instalment payments for designated entities (10% down, and 6-year interest only at the risk-free 10-year Treasury rate).²⁸ Less than one year later, it became clear that these terms were too enticing, encouraging speculative bidding, and leading all of the major bidders to declare bankruptcy. The spectrum remained tied up in bankruptcy

²⁶ OECD, p.23

²⁷ Federal Communications Commission (2007)

²⁸ Cramton (2000); Congressional Budget Office (1997)

proceedings and litigation years after the auction, leaving much of the spectrum unused during that time.

Spectrum caps, or spectrum aggregation limits were put in place to prevent any one firm from regionally monopolizing resources. This policy was abolished in 2003, as the FCC determined the level of competition to be sufficient and sustainable. Bidding credits have also been used in the FCC spectrum auctions, giving designated entities (such as small businesses with gross revenues less than US\$5 million/year) a certain percentage discount on the final payment. Empirical research has not been successful in finding many problems with this ex ante incentive. It is still possible that this gives many firms too great a discount, and consequently may encourage inefficient entry. On the other hand, some of these businesses may have been fronts for larger firms, allowing incumbents a discount for which they would not otherwise be eligible. In the most recent AWS auction, 104 bidders competed for 1087 spectrum licences, paying over \$13.9 billion. Over half of the winning bidders were designated entities who will obtain discounts (up to 25%) on the purchase price. The auction results are in question, as there is a legal challenge currently in process in the U.S. Third Circuit Court of Appeals. The plaintiffs claim that the new designated entity rules were too strict, and thus weaken the participation of small businesses in the spectrum auction. These new rules include a general tightening of the reporting requirements imposed upon designated entities, and penalizing those designated entities that are found to have an impermissible material relationship.²⁹ A designated entity would be in this “impermissible” situation when it has agreements with one or more other entities to lease or resale 50% or more of the spectrum purchased at auction.³⁰ The results of this legal dispute could put the results of the auction in doubt, and also have repercussions for the upcoming 700 MHz auction in the United States.

The final approach to favouring designated entities, spectrum set-aside, has also been employed in two FCC auctions with sub-optimal results. The first case, the

²⁹ [Federal Register](#) (2006)

³⁰ Oral arguments are tentatively scheduled for May 25, 2007

aforementioned C block auction, had other extenuating circumstances that were not necessarily due to a set-aside. A set-aside was used for a second time in the F block of the DEF block auction. The prices attained in this auction were significantly smaller, which could have been exacerbated by the small size of the F licence (10 MHz), precluding the winner from gaining enough spectrum to allow competition with incumbent firms (all incumbents own a minimum of 30 MHz). Should the United States government choose to favour designated entities, the literature states that bidding credits have done less harm to the auction process, as compared with other ex ante incentives (particularly instalment payments). Cramton (2000) and Salmon (2004), noting that the FCC has set the level of bidding credits through somewhat arbitrary means, advocate a more thorough study of the effects of bidding credits on the entry of firms, to strike a better balance between efficient markets and effective competition.³¹

New Zealand was the first OECD member country to liberalize its telecommunications industry, opening its markets to full competition in 1989. A year later, New Zealand became the first country to use auctions to allocate spectrum, opting for a second-price sealed bid format.³² Simultaneous, multiple-round auctions have been used since 1996, with internet-based bidding since 1998. As opposed to other countries, New Zealand did not use spectrum caps until 2000, when 3G spectrum licences were made available. The government similarly applied a cap to some lots in the 2002 3G auction to ensure at least three successful bidders, and automatically lifted the cap after one year to allow secondary market trading. Secondary markets for spectrum exist, but the “lightweight” regulatory regime in New Zealand has resulted in duopolistic control of the mobile telecommunications industry. Furthermore, the licences are sold according to the purchasing firm’s specifications. As the spectrum is not divided according to uniform standards, re-sale is less likely.³³

³¹ [Salmon](#) (2004); Cramton (2000)

³² In this type of auction, the bidders submit single sealed bids for auction licences. The highest bidder wins, paying the second-highest price for the licence.

³³ [Ministry](#) of Economic Development (2005); Kaspar (2006)

3. Competition and Government Incentives

In a perfectly competitive market, two or more different firms contend with each other to sell goods and services to consumers. No one company can dictate market terms, whose equilibrium values are set independently in the market and are not dictated by firms. A competitive market is an efficient market, ensuring that the proper levels of production and transactions are realized, thereby maximizing the welfare of both consumers and producers by exploiting all potential gains from trade – no buyer/consumer and no producer/supplier can do better at market equilibrium terms. The minimization of firm-level costs is thus favoured. However, no pure perfectly competitive markets exist – the level and intensity of competition depend on the intrinsic characteristics of an industry, the extent of regulatory intervention, and other general external economic conditions. But many markets come close to generating perfectly competitive outcomes as long as competitive processes are at work: free entry, limited market shares, open and efficient related markets (financial products and services, technology, contracts, etc.).

Network industries, defined as industries in which consumers connect themselves to one or more real or virtual networks, operate in a seemingly imperfectly competitive market dominated typically “by a small number of large or well-established firms.”³⁴ The wireless industry, as a network industry, is appropriately characterized in this manner – those wishing to compete incur heavy fixed costs and can benefit from potentially significant economies of scale, economies of scope and economies of networking. Competition, when properly achieved, can bring about social cohesion, productivity gains, innovation and commercialization by sending proper signals to current participants as well as to potential ones. The regulatory framework employed by the government can greatly affect the development of the wireless industry, helping to evolve the system through policies aimed to foster competition, to protect newcomers from aggressive incumbents and to protect the public against the capacity of large firms to exercise their market power through either inflated prices or reduced quality, diversity and quantity of

³⁴ Intven (2000), module 5, p.1

services.³⁵ This must be balanced against the high level of risk inherent in network industries, requiring high capital investment and long term vision while facing the possibility of stranded assets and technological obsolescence. In the case of mobile telecommunications, these fixed costs are found in acquiring spectrum, constructing facilities and hiring key personnel, with the new entrant facing even greater marginal capital costs. New entrants face as usual, additional challenges of research and development expenditures, organizational learning curve, and advertising/marketing branding costs. Finally, the switching costs for consumers might be too great, even if a new entrant were to offer a better product.

New entrants have several intrinsic characteristics that may impede their successful entry into the market, related not only to their limited experience and economies of scale, but to their “newness and smallness... which differentiate[s] them from incumbents.”³⁶ These include a lack of capital and other resources, an unknown reputation, limited power to change the competitive environment, and they face the threat of retaliation from incumbents. On the positive side, they are generally less encumbered by hierarchy, past technological choices and organizational inertia, and are thus more flexible.³⁷ These firms are generally valued from a public perspective as they are often a major source of innovation, bringing new technologies and competition to the industry and the economy as a whole through the process of creative destruction.

Telecommunication services are part of the backbone of Canadian society and it is critical that the industry is managed with the efficiency of the market in mind. Government can play an important role by facilitating the entry of new market players, consequently increasing the competitive intensity of the industry. Still, the issue of competition measurement – and the balance it requires – is of utmost importance. Too much regulation ensuing from improper assessment of industry competition can lead to unnecessary and improper manipulation of prices and other general competitive conditions causing losses in productivity, consumer welfare, innovation and growth. An

³⁵ Boyer (2005a), p.2

³⁶ Teo (2002) p.16

³⁷ *Ibid*

efficient balance between the short run interests of consumers/customers and sellers/producers is of utmost importance for the long run capacity of the industry to efficiently deliver its full contribution to increasing social well being.³⁸

3.1 Issues with Competition Measurement

Too much economic regulation can be just as detrimental as too little. The efficient management of the competitive framework of the wireless industry depends on the accurate assessment of the level of competition in the industry. The Canadian Radio-television and Telecommunications Commission uses several measures of competition, including:

- (i) Market size and market share according to criteria such as revenues and number of subscribers, lines and minutes
- (ii) The number and description of service providers in the market;
- (iii) Lists of available services, pricing levels and trends; and
- (iv) Corporate financial conditions.³⁹

Measurements (i) and (ii), both based upon market shares, would be poor indicators of the level of competitive pressures in the wireless market. The industry is fast-growing and driven by technological innovation. Accordingly, the wireless industry has “more characteristics of an emerging industry than a mature industry.”⁴⁰ Hence, the traditional method of assessing competition is inadequate. On the contrary, the current measurements, a few large firms surrounded by a competitive fringe, could be an indicator that the competitive pressures are relatively intense, so that an entry strategy by new firms is simply not profitable. Basing policy decisions on a measurement that could over-estimate or under-estimate the level of competition in telecommunications is obviously less than ideal. Moreover, the current CRTC approach “is likely to generate

³⁸ Boyer (2005a), p.2

³⁹ Industry Canada (2007), p.17

⁴⁰ Boyer (2005a), p.3

significant welfare harm to consumers and businesses as well as efficiency losses for the Canadian economy.”⁴¹

The wireless market is a sub-set of the larger telecommunications industry, an industry which offers competing and complementary products such as wireline communications, wireless and voice-over-internet-protocol (VoIP) telephony. To determine whether the relative competitive pressures are sufficiently intense, “one must define the relevant market, the relevant choice set that consumers face regarding the satisfaction of their telecommunications needs, and the relevant set of competitors to determine the level of competition in the telecommunications industry.”⁴² The measurement of interest is the level of substitutability between products and services from the point of view of consumers. Substitutability is defined as the cross-price elasticities of the demands for wireless, wireline and VoIP services. The price elasticity of demand is a measure of sensitivity of demand to a positive change in price, measured by the ratio of percentage change in the quantity demanded over the percentage change in price. To obtain the cross-price elasticity, the price that changes is the price of the compared product or service. If the elasticity is positive, the compared goods are substitutes; if the elasticity is negative, the compared goods are complements.

I will use a simple example to illustrate this point. If Bell Mobility could profitably increase its price of wireless services by 5% above its competitive level and maintain such increase for a period of one year, then this would indicate that the switching capacity of consumers to other services (VoIP, wireline services, and other wireless providers) is sufficiently limited that not only the wireless telephone services would be the relevant market but also the level of market power in that market would be considered as relatively important. If Bell Mobility needed its other industry sector competitors to raise their prices too by an equivalent amount in order for the increase to be profitable for Bell Mobility, then the relevant market would be defined including the other services. Recent empirical results suggest that wireless telephone services and wireline telephone

⁴¹ *Ibid*

⁴² *Ibid* p. 15

services are relatively significant substitutes. As for VoIP, its fast growing pace indicates that it is too becoming a significant player in the market of telecommunications services.

Measuring the level of competition by substitution potential is a more credible measure of the competitive pressures in an industry characterized by rapid change and technological innovation. Telecommunications products and services will increasingly “be seen as a ‘technology’ to generate a vector of communications (and entertainment) characteristics that customers value.”⁴³ Customers evaluate the contribution to their individual communications portfolio, and not the specific stand-alone characteristics of any one service.⁴⁴

3.2 Current Level of Competition in the Canadian Wireless Industry

The existing cellular/PCS carriers in Canadian wireless industry have networks that reach 97% of the population. Industry Canada considers the network to be “mature, with well-established infrastructure, maintenance, marketing and customer service presence across the country.”⁴⁵ In this section, I will question the contention that the wireless industry is “mature”. The annual *CRTC Telecommunications Monitoring Report* states that the Canadian “wireless market continued to display strong growth and remained competitive in 2005...” with revenues increasing “from \$9.5 billion in 2004 to \$11.0 billion in 2005, a ... 16.2% increase.”⁴⁶ It represents the largest sector of the telecommunications market, “accounting for 32% of the industry's revenues.”⁴⁷ Wireless subscribers increased 13.3% over the same time period, increasing from 15.0 million subscribers to 17.0 million. There are three major players in the market and no company enjoys clear dominance in terms of revenues or subscribers.⁴⁸

⁴³ *Ibid* p. 19

⁴⁴ *Ibid*

⁴⁵ Industry Canada (2007), p.15

⁴⁶ Canadian Radio-television and Communications Commission (2006), p. iv

⁴⁷ *Ibid*

⁴⁸ *Ibid* p.82

A comprehensive review shows that Canadian wireless pricing compares favourably with other OECD countries.⁴⁹ Canadian mobile prices are consistently close to or below the OECD average: in 2001, high volume users paid 25 % less in Canada than in the OECD; in 2003, high volume users enjoyed the second lowest rate in the OECD; in 2005, high volume prices moved up slightly to the 7th lowest in the OECD. Canada has also experienced some of the steepest declines in Revenue per Minute: 43 % over the last 5 years. In terms of growing penetration and strong usage and despite the 18 month head-start in the US, Canada has kept pace: both countries enjoyed 17 per cent annual subscriber growth over the last 5 years. Canadians continue to surpass the rest of the OECD in their mobile usage: at 400 minutes of use per month, Canadians are the second highest users, following only the US (800 minutes). In fact, Canadians spend more time on their phones than the Japanese or Swedes, both countries where over 100 per cent of the populations own mobile devices.

The barriers to entry in the wireless market are not insignificant. As previously discussed, potential entrants in the mobile telecommunications industry encounter these barriers in the form of massive, risky capital expenditures to establish the necessary infrastructure, of the threat of retaliation from incumbent firms, of significant research and development expenditures, of the particularities of their organizational learning curve and of advertising/marketing branding costs in addition to consumer switching costs. The incumbent players, in the market since 1985 and in large part the cellular mobile operators affiliated with wireline carriers,⁵⁰ enjoy the aforementioned established infrastructure that allows them to take advantage of economies of scale. These incumbents have been the biggest players in the recent sale of mobile spectrum by auction in 2001, and have also acquired much of the spectrum made available for Fixed Wireless Access.

The wireless industry, taken independently, may be incorrectly interpreted as a mature industry. Despite the constancy of the three national carriers as the dominant players in

⁴⁹ CWTA

⁵⁰ Industry Canada (2007), p.15

the industry, prices are far from uniform and technologies are evolving at a fast pace; both relatively uniform prices and relatively stable technologies are necessary characteristics of a mature industry.

The wireless market splits into two types of subscribers – pre-paid and post-paid. As of 2005, the post-paid group constituted 77% of the market. Within the post-paid group, there are almost infinite sub-groupings into different plan packages that use voice, data, or other telephony and internet services. These small differentiations in service plans (minutes, peak time calling and conditions) soften the competitive pressures of the industry that otherwise would be too intense to ensure the survival of firms, incumbents and entrants alike. Competitors are inclined not to compete directly in price, as it is likely to end up in a money losing price war.⁵¹ In the absence of differentiation, the industry would likely fall into the Bertrand equilibrium trap: relatively uniform prices close to marginal costs with losses equivalent to fixed entry and production/marketing costs across the industry.

Many factors other than pricing drive the demand for wireless services, including coverage, digital versus analog transmission, and phone design features. There is increasing direct competition between the wireline and wireless carriers, and now, voice-over internet protocol (VoIP). Other, non-price factors also include the virtual goods of connectivity, flexibility, safety, accessibility, capacity and user-friendliness. No single telephony solution offers a clearly dominant package. Eventually, large scale IP telephony will further blur the lines between wireless and wireline – competing with the wireless and wireline industries on their home turf.⁵² Although these separate telephony solutions are in competition with each other in some respects, in other situations they are complementary. The telephony services mix decision is not a regional decision – it is a household-level choice, and the modeling of the level of industry competition should take this fact in account. The Canadian government should implement a regulatory framework that encompasses the dynamic of complementarity, convergence and substitutability in

⁵¹ Boyer (2005a), p.9

⁵² *Ibid*, p.9-11

the telecommunications industry. It is for these reasons that the market is hard to define and the market shares accordingly difficult to calculate.

3.3 Is There Enough Competition?

Using the level of substitutability framework, I believe that there is enough competition in the wireless sector of the telecommunications industry, enough for new entrants to be successful if they were to offer a product that is superior to the existing ones in at least one dimension, to name just a few: products, services, technology and customer service. Therefore, only potential entrants that believe they can compete with and displace the industry incumbents by having the capacity to offer one or more aforementioned deliverables will consider entering or will enter the industry. This type of competition enhances efficiency through a process of creative destruction that directly benefits the consumer.

Nonetheless, competition measurement is a complicated problem with no easy answer. Although I consider the level of competition to be sufficient, there are other policies that the government may employ to facilitate the entry of new market participants that includes but is in no way limited to ex ante measures such as market share caps and spectrum set-aside and ex post measures such as conditional investment credits and subsidies, as I will explain further below. The government must focus on the efficiency of its policies in creating a marketplace that is not just competitive; it must also foster innovation and productivity gains. In the next section, I will compare the economic impact and efficiency of ex ante and ex post measures in building the type of competitive telecommunications environment that Canada needs, and describe how competition can be promoted through the determination of proper incentives.

It is not so much wireline communication, mobile communication under its different forms, or IP telephony, which is demanded but rather characteristics (virtual goods) such as the above connectivity, flexibility, safety, dependability, accessibility, capacity (high speed and broadband), and user-friendliness. Connectivity refers to the geographic area

(or to the set of potential called/calling parties) over which communications can be established; connectivity is a multidimensional characteristic since it relies often on a multi-layer pricing plan: different connectivity at different prices. Flexibility refers to the availability of the service under different circumstances, the most important being certainly the availability throughout a given geographic area, as one moves around in the area. Safety refers to the health hazard one may be exposed to in using the service on a regular basis, an example being the concerns for safety which have prompted different jurisdictions to forbid the use while driving of handheld cell phones, in some cases all uses of cell phones. Dependability refers to the assurance of service of a high quality level, for example free of parasites and free of breach of confidentiality, when one needs it, especially but not only in an emergency situation. Accessibility refers to the availability of the service when one wants to communicate with another party. Capacity refers to the possibility to transmit vast amounts of information, such as large files, high definition pictures as well as videos, at a rate high enough to quasi-replicate *in situ* communications. User-friendliness refers to the ease of use of the technology and service.

It is because they can offer some combination of the above characteristics that the different telecommunications products and services are of interest to consumers. Clearly, none of the available telecommunications products and services dominates the others in every single dimension of every single characteristic.

The 2003 telephone survey of Ipsos-Reid, commissioned by the CRTC,⁵³ indicates that among three important factors influencing their choice between providers of long distance, cellular or Internet service provider, consumers chose the “price” as the most important factor, followed by the “quality of service”, followed by the “convenience (having their service bundled with other services from the same provider)”. When asked to choose the top two factors influencing their choice of local service provider, consumers mentioned the following: price (58%), quality of service (45%), reliability (31%), convenience of single billing (23%), convenience of service package (19%),

⁵³ Discussed in the CRTC 2003 Report on the Status of Competition in Canadian Telecommunications Markets.

number portability (19%). When asked whether it was easy to compare the prices and features of services between different providers, a majority of consumers stated that it was indeed easy (when applicable): for local service (62%), for long distance (69%), for cellular service (63%), for Internet service (74%).

Eventually, large scale IP telephony will change the competitive configuration between wireless and wireline by making fuzzier the relative advantages and disadvantages of those technologies. IP telephony has many advantages that till now have been specific to either wireline, such as quality and reliability of voice and data transmission and connectivity, or wireless, such as mobility and accessibility. It is therefore going to be a significant competitor for both wireline and wireless telephony on their own turf. The elusive no man's zone between wireline and wireless telephony is disappearing as the zone is soon to be claimed and occupied by IP telephony.

There are also reasons to believe that wireline and wireless telephony are, for a significant number of consumers, *complements* rather than *substitutes*. The development of different telecommunications technologies, each with important specific characteristics (connectivity, flexibility, safety, dependability, accessibility, capacity, friendliness), tends to increase the global usage level of all telecommunications technologies. However, the composition of such a higher usage may be asymmetrically distributed and differentially shifted over time across the different technologies. In such a context, the net empirical estimates of substitutability, as measured traditionally by the cross-price elasticities, could lead to a significant *downward bias* in the measured or perceived level of competition in the local access market. The ever-increasing number of consumers having access to both technologies and having access soon to a third one, the VoIP technology, continuously reduces the need for protection.

3.4 Competitive Processes: A New Regulatory Framework

Economic efficiency refers to the correspondence between outcomes and objectives. Hence, insofar as an objective of the regulatory system is to achieve the maximal possible

consumer and producer surplus (gains from trade) in that industry, then the regulatory framework must aim at making sure that competitive processes are at work in the industry. Competitive markets are the most likely to maximize the total surplus in the industry, that is, the value added or created by the industry. As for economic effectiveness, it is defined as the relation between the output measures in the industry and the measures of inputs used in the industry: the production of goods and services in an industry is termed economically effective when those goods and services are produced at the lowest possible cost. Competitive markets give firms incentive to minimize cost. In this sense, the public interest is served with an effective production of goods and services.

In a regulatory context, this means that it is more important to concentrate on the emergence of competitive conditions and processes than to simply measure market shares, particularly in emerging industries. When markets are ineffective and/or inefficient, potential gains from trade are left unexploited. This in turn may lead to less responsive markets, and a loss in welfare. Two major causes are sub-optimal market structures and the inadequate reflection of costs and benefits in prices. This has implications for firms, governments and society. Although a truly optimal market exists only in theory, the justification for moving towards competitive (effective and efficient) markets is justified by the attendant gains in societal welfare wherever possible. This rationale is even further justified by the constant introduction of new technology into markets, which in turn helps to reduce the need for public regulation. As Milton Friedman stated, “in a rapidly changing society... the conditions making for technical monopoly frequently change and I suspect that both public regulation and public monopoly are likely to be less responsive to such changes in conditions.”⁵⁴ In all cases, governments do well to manage with the symbiotic goals of consumer welfare and producer efficiency in mind.

In the case of telecommunications, the real conundrum of the regulator is to create and enforce static (short-run) competitive conditions between the current bundles of products and services or technologies as well as dynamic (long-run) competitive conditions

⁵⁴ Friedman (1962), p.28

yielding strong intensity of incentives for developing new technological platforms, introducing new products and services that could be both cheaper and more efficient, connectivity-wise and flexibility-wise, and in so doing replace the current goods and services and possibly their producers and distributors.⁵⁵

This cannot be achieved with mere ex ante or upfront subsidies for promoting competition. The existence of these incentives does not guarantee the entry of efficient firms, it does not guarantee their ability to compete once in the market, and it does not guarantee their long-term viability. The only guarantee is that the government will pay such subsidy to the entrant. Potential entrants should evaluate the entry decision just as they would without the subsidy, yet the existence of the subsidy makes it less likely. Like the entry decision, prices and quantities must emerge from the pressures of a competitive environment. Exerting a proper level of competitive pressures is the only way to encourage efficient entry and the only way to induce firms to really minimize the costs of their goods and services (to make the accounting costs close or equal to the economic costs). Government, as the regulatory body, should focus on its policies and means as regulator, employing a renewed pro-competition regulatory framework. Three main responsibilities will be emphasized, which include (1) being the trusted generator of consumer information, (2) acting as the manager of level playing field conditions and (3) promoting efficient investment programs.

As the trusted generator of consumer information, the government could, perhaps indirectly, make sure that customers understand fully the details on pricing structures and product characteristics underlying the derived demand for telecommunications goods and services, namely connectivity, flexibility, safety, dependability, accessibility and user-friendliness. The complexity of the pricing structures allows competing firms to soften price competition, and thus a regulator could help inform customers as to the real costs and benefits of the different packages on the market in terms of their intended use or consumption could promote competition without getting into price or entry manipulation. Better customer information helps combat consumer welfare loss through differential

⁵⁵ Boyer (2005a), p. 26

pricing. More importantly, it is also a strong factor of competition and economic efficiency.⁵⁶

Towards this goal, the recent recommendations of the Telecommunications Policy Review Panel go a long way in establishing level playing field conditions. By focusing on ex post regulation mechanisms, there are remedies for potential entrants following actual market entry. Although prices have already been deregulated in the mobile communications industry, the amendment of the *Telecommunications Act* to substitute the presumption of regulation for the presumption of deregulation⁵⁷ will help to level the playing field not only within telecom sectors, but foster greater competition between all types of communication technologies.

While regulators recognize the efficiency gains that can be had by substituting competition mechanisms for imperfect regulation, it is not necessarily desirable to introduce competition in all segments. Although new technologies of wireless telephony, cable telephony and VoIP telephony make the local loop of the traditional wireline services less of a barrier, there are still important reforms that will help improve competition through open (inter)access to all network facilities. To access the facilities, entrants or competitors are asked to pay an access price. The incumbent would grant access to all firms on a non-discriminatory basis. The art is to ensure that the access price is “right,” thus encouraging only efficient firms to enter the market. Real options⁵⁸ valuation must be used to model the volatility, irreversibility and managerial flexibility at the heart of the network building and entry decisions. The decision on firm entry will thus depend on access pricing that extend beyond expected return on investment to the value of the real options (other business opportunities) exercised in network development and this, to ensure the efficient development of such networks.

⁵⁶ Boyer (2005a), p.28

⁵⁷ Telecommunications Policy Review Panel (2006a), Recommendation 3-3

⁵⁸ A **real option** is the right but not the obligation, to undertake some business decision, typically the option to make a capital investment. In this case, the option is the right to enter the wireless market, a decision that would then open other real options that should be evaluated in the entry decision.

4. Economic impact of potential subsidies to new market entrants

As I mentioned above, the policies that the government may employ to facilitate the entry of new market participants includes but is in no way limited to ex ante measures such as market share caps and spectrum set-aside and ex post measures such as conditional investment credits and subsidies.

For the reasons discussed in the previous sections, there seems to be no economic reason to subsidize entry in the wireless communication services industry given the level of competition already present in the industry defined as the telecommunication services industry encompassing all substitute services on all platforms. If the government still wishes to favour the entry of new firms through the forthcoming intended spectrum auction, I will argue that the second type of policies, that is, ex post policies should be designed and implemented.

The barriers to entry in the wireless market may be substantial; nonetheless, it is “the post-entry conditions, post-entry prices and post-entry profits rather than the corresponding pre-entry levels... which are the drivers behind the entry strategies of potential competitors.”⁵⁹ In any industry, potential competitors understand the importance of the “price and profits they will be experiencing if and when they enter the market and compete with the incumbent firm.”⁶⁰

There are several incumbents in the mobile communications industry but there is enough space for a new entrant should this new entrant be able to significantly distinguish itself in terms of the product mix, e.g. the range of services, and the pricing conditions it would offer its customers. Consumers are most likely indifferent between the different forms or technologies by which they satisfy their needs for telecommunications services, as long as their demand for connectivity and flexibility, the two most important characteristics that they value, are comparable or at least similar in terms of quality and affordability. In

⁵⁹ Boyer (2005a), p.24

⁶⁰ *Ibid* p.31

most cases, consumers are not even aware of the technological characteristics of the platform on which their calls and other services are transmitted.

Entry in any industry is difficult and risky. Following entry in an industry, a period of monetary losses, which can extend over many years, is the norm rather than the exception. The situation is and will be no different in the wireless services industry, in particular in the AWS industry. Hence, these monetary losses cannot be the basis on which the government might want to subsidize entry as it would have to extend such a policy to every industry in the Canadian economy. Favours to new entrants or designated entities not only complicate the auction process but it may also make the AWS industry less efficient insofar as inefficient new entrant may find it profitable nevertheless to participate in the auction, eventually win a licence and enter the industry

Efficient and effective allocation of spectrum is part of the necessary conditions for productivity gains and growth in the Canadian economy. To this end, entering firms should be given maximum flexibility in their licensing terms, in order to allow them to put acquired spectrum to best use. Additional liberalization of rules governing spectrum trading should be implemented, allowing divisibility of spectrum and facilitating secondary spectrum markets. In fact, allowing market-based exclusive spectrum rights increases the flexibility of existing companies in the ICT sector, which could have important spillovers in other sectors. It is nonetheless important to implement certain safeguards for these secondary markets, as a new entrant could potentially use the ex ante incentives to purchase the licence at a lower cost and then resell the licence at a profit to incumbents. Spectrum trading rules should be liberalized – with caution – to avoid speculation and profiteering.

Should the government still wish to adopt a pro-active strategy to favour the emergence of competition, the solution is quite simple: by subsidizing the entrant directly to compensate for the “unfair” competitive advantage if any of the incumbent. One way to do it would be to make a lump-sum or per-unit transfer payment (bidding credits) to the entrant upon market entry, resulting in a simple ex ante subsidy. This may, however,

induce entry by inefficient operators. Upon seeing a “risk-free” windfall in the form of the subsidy, it may encourage firms to enter without taking the appropriate analysis of the entry decision, and create consumer welfare loss as these firms lacking viable long-term strategies fail in the market.

Ex ante incentives are designed to help new entrants ease their potential for market entry. As the prior discussion on barriers to entry indicates, the challenges faced by aspiring new entrants are numerous and significant. The competition principles established by Industry Canada exist to “promote a competitive post-auction marketplace.” Lowering the barriers for new entrant market participation is viewed as a way of putting this principle into practice, by applying the policy levers of restricted licences and spectrum aggregation limits on a case-by-case basis. Ex ante incentives should be employed with caution, as they may prompt the entry of inefficient firms lacking the motivation to establish themselves in the market over the long term; or worse, induce the entry of speculators manipulating the system to make a quick profit.

In the current case, Industry Canada has proposed a spectrum set-aside, an ex ante incentive that would restrict certain incumbent companies from holding certain licence by setting aside “a certain amount of spectrum for which only new entrants would be eligible to bid.”⁶¹ Industry Canada has defined a new entrant as “one who does not operate, or does not have an affiliate that operates, a national wireless PCS/Cellular network that offers high mobility phone services.”⁶² This set-aside is equivalent to an ex ante subsidy. Rather than directly giving the entrants money, the government creates the same effect by limiting the potential range of bidders and hence manipulating the price of the licence downwards. Other forms of ex ante subsidies are or may be considered also, namely mandatory roaming as well as tower sharing and co-location. Such measures are not all perfect substitutes as far as subsidies are concerned and may be better left to the parties to negotiate while favouring efficient access pricing to proprietary infrastructures, based on

⁶¹ Industry Canada (2007), p. 22

⁶² *Ibid*

appropriate cost sharing procedures,⁶³ including the value of the real options exercised (capital base) in building the infrastructure itself. In such a context, the government must make sure, for efficiency reasons, not to intervene directly in setting the inter-access charges to essential or bottleneck facilities while ensuring that such access is available, when necessary, at proper non-discriminatory conditions and prices, to foster entry by *more* efficient providers.⁶⁴ The regulator must also recognize that the proper non-discriminatory conditions and prices must account for the real options that are exercised, as the network is being built or developed. Eventually, the network developing firm is stuck with the technological characteristics of its realized network. Exercising those real options can represent a significant cost in network development and must therefore be accounted for in determining the proper non-discriminatory access prices and conditions that will govern the use of the incumbent's network by competitors. Unless a proper account is made of those real options related costs, the development and maintenance of the telecommunications networks are likely to be inefficient, thereby imposing significant real costs on society.

Unless such principles are clearly affirmed, the different ex ante subsidy measures create a serious regulatory risk that may cause and justify investment chill and increased cost of capital leading to socially costly distortions in the development (investment) of the telecommunications network infrastructures. Although it is difficult to put a precise figure on those socially costly distortions in the development of the Canadian telecommunications infrastructures, their effects are nevertheless potentially serious enough to warrant a very cautious approach to their implementation, if indeed they are in the end considered by government authorities.

Designating any one specific entity or group of entities for special treatment is extremely difficult and can have adverse effects. Although competition may be enhanced by levelling the playing field, favours to designated entities "greatly complicate the auction

⁶³ Boyer, Moreaux, Truchon (2006)

⁶⁴ For a presentation and discussion of access pricing rules, see Marcel Boyer and Jacques Robert, "Competition and Access in Electricity Markets: ECPR, Global Price Cap and Auctions," pp. 47-74 in Georges Zaccour (ed.), *Deregulation of Electric Utilities*, Kluwer Academic Pub., 1998.

process” and often “become a central issue in establishing the auction procedures,” leading to the “absolute worst outcome in a spectrum auction... licences tied up in litigation.”⁶⁵ The mere risk of litigation can also deter bidding activity, lower revenues and consequently lead to non-market outcomes. In fact, “one of the strongest reasons for strengthening ex post components is that the regulatory agency may have insufficient information to adopt an efficient ex ante approach.”⁶⁶

Moreover, such measures are likely to generate significant losses for the public treasury by limiting the competitive intensity in the auction process. As we have shown above, the auction rules, which determine the competitive intensity and the value of the licences being auctioned, are very important elements of the success of the auction procedure.

Alternatively, the government could promise an ex post subsidy, such as a sufficiently generous but deferred tax credit or investment grant to be paid N years after entry conditional on successful entry, which could be measured as a market share greater than X%. All potential entrants with superior products or services, and/or superior technology, and/or better quality consumer service, , and only those, who believe they can compete with and displace the incumbent one way or another, will enter or consider entering the industry. Inefficient competitors, fly-by-night operators and fast-buck seekers will stay out. Consumers and customers will reap the benefits of efficiency-enhancing competition through proper creative destruction.

The adoption of ex post incentives does not in itself guarantee an efficient outcome, but it can help to encourage entry by firms with the proper mix of competitiveness and efficiency to enter the market. With this in mind, ex post incentives are most compatible with stated telecommunications policy, fostering a competitive marketplace that enhances the welfare of Canadians. The effects are non-distortive and will not create undue welfare costs brought by inefficient firms entering the market, as would likely happen with an ex ante subsidy, and would not generate a dampening effect on bids and therefore on public

⁶⁵ Cramton (2002), p.33

⁶⁶ [Bauer](#) (2005), p.5

revenues from the intended spectrum auction. We saw above that ill-conceived auction rules may reduce significantly bids, hence public revenues. Although raising revenues is not a primary goal of the auction, it is important that the public resource that the spectrum represents be allocated efficiently and responsibly.

The most important role of government, however, is not to favour groups in the hopes of creating competition, but to act as an effective regulator to make sure that the necessary conditions for competition exist, within safeguards. Ex post regulation, allows experimentation in business models and can be an incentive to innovate.

Research and empirical analysis of spectrum auctions has suggested that the allocation of spectrum is just as important as the methods for its assignment. Allocation defines the licence in terms of geography, the frequency band (size), and length of time that the bandwidth may be used. As the spectrum made available for AWS auction is unlikely to be considered for competing uses (e.g. broadcasting, military, public safety), the lessons that would be most appropriate to apply to the Canadian spectrum auction pertain to the quantity of licences to be offered, their size, and the length of licence. The last point is particularly important as the licence terms must be designed to discourage speculation and profiteering, where a “new entrant” firm could bid successfully on a licence and then turn around and re-sell the licence at profit to an incumbent that may have been prevented from participating in the auction in the first place.

The further exploration of exclusive market-based spectrum rights is a promising avenue of research. To date, no country has fully commoditized their spectrum resources.⁶⁷ The current regime effectively locks spectrum away in blocks of bandwidth licensed to but a few companies, while not all spectrum is fully put to use. In a sense, the current regulatory regime makes spectrum an artificially scarce resource. There is potentially an argument to be made that viable commodity markets for spectrum would drive down

⁶⁷ Guatemala and El Salvador are the only countries that have come very close to establishing private spectrum ownership. Following the establishment of 15 year, expandable property rights in 1996 and 1997, respectively, these two countries utilize about 50% more bandwidth for mobile telephony than the Latin American mean. For more information, see Hazlett and Munoz (2006).

price and encourage innovation in bandwidth-dependent industries. An interim step could be shorter licensing terms with rights for the current licence holders to renew, along with the establishment of secondary markets for spectrum that would put unused spectrum to better use. If constructed correctly, there would then be no need for “use it or lose it” provisions in licensing agreements; firms with licences would have sufficient incentive to put spectrum to best possible use, either internally or on the spectrum market.⁶⁸

In Canada, the structure of spectrum auctions is such that a bidder can win at most a limited number of licences based on competitive conditions including the market power of the bidder.⁶⁹ Auctioning five spectrum blocks could guarantee that there will be at least one and possibly two blocks available for non-national carriers to purchase. As the spectrum will be licensed under the *Radiocommunication Act*, Canadian ownership and control requirements are imposed, limiting the threat of entry from foreign firms. These two structural decisions render the proposed spectrum set-aside unnecessary and beg the question: why incorporate a set-aside at all?

If Canada were to allow bidding on multiple blocks of spectrum or loosen requirements on domestic ownership, the set-aside might be worth considering. On the other hand, the same ex post incentives that I have discussed could be applied if the rules were changed to allow foreign firms to enter the market. Ostensibly, these firms would behave more as incumbents than as new entrants, so the governmental incentives could apply to true “new entrants” without significant wireless market experience and to Canadian-held firms. Given the current restriction allowing only domestic ownership of radio spectrum, the spectrum set-aside (as proposed) ensures that those licences will sell for less, resulting in an effective price manipulation in favour of entering firms. The effect is indistinguishable from an ex ante cash subsidy; it is likely to invoke undesirable effects for the Canadian consumer and weaken the competitive pressures in the wireless communications sector

⁶⁸ De Vany (1998) and Hazlett (2003)

⁶⁹ Industry Canada (2001)

5. Conclusion and Final Recommendations

Government undoubtedly has a crucial role to play in the management of spectrum policy, as spectrum is a scarce resource that will only grow in importance as wireless technologies continue to evolve. Given the rapid rate of technological innovation in this sector, the possibilities are infinite and ever-evolving.⁷⁰ The Telecommunications Policy Review Panel is right to recommend replacing the presumption of regulation with one of deregulation, and to move “away from before-the-fact (*ex ante*) regulatory prescriptions to approaches that place greater reliance on after-the-fact (*ex post*) regulatory intervention, based on verified complaints of significant market problems.”⁷¹

These general principles can be applied in practice in the upcoming advanced wireless services spectrum auction to help increase competition, encourage innovation and improve the welfare of the Canadian consumer. The continued growth of the Canadian economy nonetheless depends on the proliferation and adoption of advanced ICT technologies in all sectors, regardless of location, size or business type. Clearly, other determinants of the rate of ICT expansion must be examined. It is time for a new regulatory approach to technology, particularly as it pertains to the burgeoning and converging telecommunications sector. This sector has increased its competitiveness as technological advances such as VoIP and third generation (3G) mobile technology further blur the traditional lines between wireless communications, wireline services and broadcast technologies. Growth in all sectors depends on the proliferation of these advanced technologies, which in turn depend on efficient, effective allocation of spectrum (radio bandwidth) to the best uses.

It is my opinion that the government should tread lightly when it comes to intervention in the wireless market. Accordingly, a list of policy recommendations follows.

⁷⁰ The Economist (2007), p.11

⁷¹ Telecommunications Policy Review Panel (2006b)

- (1) Spectrum Auctions are an efficient way to allocate bandwidth to best use, still Canada should consider implementing several reforms in its auction process:
- Abolish spectrum “set-asides” as an implicit subsidy that on balance is inadequate for encouraging competition. Rather, set-asides promote the undesirable entry of inefficient firms in an already competitive sector;
 - For future auctions, Canada should investigate the feasibility of implementing multiple block auctions considering the successful experiences of major trading partners;
- (2) Licence size and terms are just as important as the structure of auctions:
- As currently proposed, the amount of spectrum for sale in the upcoming AWS auction guarantees the entry of a new firm, hence, a set-aside is unnecessary and redundant;
 - Canada should allow for the flexible use of spectrum and construct non-restrictive licences;
 - Secondary markets for spectrum should be established, allowing for divisible spectrum and exclusive rights;
 - Certain safeguards should be implemented to prevent overnight profiteering on licence resale;
- (3) The Canadian government should adopt a competitive processes approach as a new regulatory framework for the telecommunications industry;
- (4) Should the government wish to adopt a pro-active strategy to favour the emergence of competition, it should take the form of an ex post subsidy paid to successful new entrants several years after market entry.
- (5) Although I recommend the forbearance of telecommunications-specific regulations, competition law still applies. The Competition Bureau will still follow the standard guidelines regarding conduct, predatory pricing and merger and acquisition activities, just as it would in monitoring any other industry. There is no need to establish a telecommunications-specific competition monitoring agency.

Mobile telecommunications form a critical part of advanced information and communications technologies (ICT), which is the backbone of the international economy.

A renewed focus on regulatory reform and market-based methods of spectrum allocation will encourage innovation, and help close the productivity gap between Canada and its major trading partners, and improve Canadian consumer welfare through continuing economic growth.

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