

Economic Issues Relating to the Framework to Auction Spectrum in the 2GHz Range

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1. INTRODUCTION

1. The extent to which the Canadian telecommunications industry has evolved in recent decades was highlighted by the recent *Telecommunications Policy Review Panel Final Report 2006* ("TPRP Report") which states:

The telecommunications industry environment has changed dramatically over the past 25 years, and the pace of change is accelerating. Today, the industry has almost completed its transformation from a small group of regional monopolies operating as regulated 'public utilities' and providing a limited set of basic telephone service. The industry now consists of a dynamically competitive group of companies operating in an open market environment. These companies now compete with many regional, national, and global players to provide a wide range of telecommunications applications and content services using new technologies.¹

2. The telecommunications industry is less and less about the provision of plain old telephone service, and more and more about wireless services. Wireless subscriptions (55.1 per 100 inhabitants) are now almost identical to wireline subscriptions (55.3 per 100 inhabitants), and provide a significant contribution to total operating revenues of the industry (36.3% as of the fourth quarter 2006).² As a result, spectrum will continue to increase in importance and will have a significant impact on how these services will continue to evolve. The importance of spectrum and wireless services and determining their appropriate provision is only going to continue to grow:

The wireless was once a big, wood-panelled machine glowing faintly in the corner of the living room. Today's wireless device is the sleek mobile phone nestling in your pocket. In coming years wireless will vanish entirely from view, as communications chips are embedded in a host of everyday objects. Such chips, and the networks that link them together, could prove to be the most potent wireless of them all. ... No longer tied down by wires and cables, more information about more things will get to the place where it is most valuable. ... Government will play a crucial role, not least because radio spectrum will be in short supply. That makes it more important than ever that the airwaves are sensibly allocated according to the ability to pay.³

3. It is thus timely that Industry Canada has begun a consultation process regarding the framework to auction spectrum in the 2GHz range in response to the

¹ *Telecommunications Policy Review Panel Final Report 2006*, page 3-3.

² Statistics Canada, *The Daily*, May 14, 2007, available electronically at <http://www.statcan.ca/Daily/English/070514/d070514d.htm>.

³ "When everything connects" *The Economist* 28 April 2007: 11.

increased demand for spectrum from a variety of current and potential market participants.⁴ Industry Canada has a mandate to respond to the demand for spectrum and since spectrum is a fundamental resource for facilities-based wireless carriers, Industry Canada wants to ensure that the appropriate amount of spectrum is made available.

4. The Advanced Wireless Services (“AWS”) auction will contribute to making sure that adequate spectrum is available to meet demand for the deployment of fixed and mobile broadband networks across Canada. At a general level, the fact that license assignments are being allocated through an auction process means that spectrum management is relying on market-based approaches. However, market forces can be undermined depending on the extent to which an open auction model is altered.

5. Efficiently allocating resources at an initial stage and encouraging competition are of great importance. When resources are allocated efficiently, unnecessary transaction costs and revenue loss are avoided. However, in the presence of asymmetric information, efficiency often requires mechanisms to elicit private information from individual participants.⁵ An unrestrained auction is a mechanism that can elicit both private information and achieve revenue maximization.

6. An unrestrained auction is a highly efficient, market-based approach for spectrum management.⁶ The benefits of an auction for assigning licenses is summarized by Cramton (2002):

The primary advantage of an auction is its tendency to assign the spectrum to those best able to use it. This is accomplished by competition among license applicants. Those companies with the highest

⁴ Industry Canada, "Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services," DGTP-002-07, February 2007.

⁵ Asymmetric information exists when the parties involved have different information regarding the situation at hand. Classic examples are, sellers of cars have better information regarding the car's quality than buyers, and workers have better information about how hard they are willing to work than their employers. Asymmetric information is an issue that occurs in all markets. With respect to spectrum licensing, there exists asymmetric information between the government and firms regarding the firms' valuation of the spectrum. Since efficiency requires the spectrum resources be allocated to the firms best able to use them, the presence of asymmetric information makes it difficult for the government to determine which firm has the best use of the spectrum. Asymmetric information also makes it difficult to generate maximum revenue and to make the process transparent. Auctions are a mechanism designed to deal with the issue of asymmetric information.

⁶ The term unrestrained auction in this context refers to an auction process that does not impose set-asides or aggregation limits.

- value for the spectrum likely are willing to bid higher than the others, and hence tend to win the licenses. ... A second important advantage of auctions is that the competition is not wasteful. The competition leads to auction revenues, which can be used to offset distortionary taxation. Finally, an auction is a transparent means of assigning licenses. All parties can see who won the auction and why.⁷
7. Furthermore, an unrestrained auction will be spectrally efficient in that firms have the flexibility to purchase the amount and type of spectrum that they require in order to most effectively provide the services they want to offer. If a firm only requires 10 MHz of spectrum, then they have the opportunity to only bid on 10 MHz of spectrum.
8. A question raised by Industry Canada's consultation paper is whether it is appropriate to adopt mechanisms specifically intended to facilitate the acquisition of spectrum by new entrants:
- In response to the AWS consultation [2003], views were expressed that it may be possible for some of the incumbent carriers to dominate the market by purchasing all or a majority portion of the spectrum being auctioned. Such an outcome could have the effect of lessening potential competition by preventing market entry of new AWS service providers and may be contrary to the public interest.⁸
9. Industry Canada requests comments on implementing three potential entry-assisting policies. These policies are (i) spectrum set-asides; (ii) spectrum aggregation limits on auctioned spectrum; and (iii) mandated roaming. First, spectrum set-asides are designed to restrict the participation of current wireless providers on a specified frequency block.⁹ This would allow new entrants to bid without having to compete against the current wireless providers; however, it does not guarantee the participation of a new firm in the wireless market. Second, spectrum aggregation limits are designed to prevent the concentration of spectrum by any single firm, and to reduce the possibility that an existing firm could inefficiently¹⁰ outbid other firms and keep them

⁷ Cramton, P, (2002), "Spectrum Auctions," *Handbook of Telecommunications Economics*, Vol.2, Cave, Majumdar and Vogelsang, eds., New York: Elsevier, 605-639, page 608.

⁸ Industry Canada, "Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services," DGTP-002-07, February 2007, "Part II(2): Fostering a Competitive Wireless Market," pages 13-23.

⁹ *Ibid.*, page 22.

¹⁰ There is nothing inefficient with respect to one firm with a higher valuation for a good outbidding another firm. Our use of the term "inefficiently outbidding" refers to a firm that bids for a good in an attempt to deter entry with no intention of using the good in a productive manner within a reasonable period of time.

from acquiring necessary spectrum.¹¹ Third, the concern behind the mandated roaming is that new entrants will be at a competitive disadvantage relative to existing firms if their customers have no ability to roam onto other networks.¹²

10. While these entry-assisting policies are presented as individual policy proposals, the impact on market forces must also take into account how the policy proposals interact with each other. For example, spectrum set-asides and aggregation limits are very similar policies that limit the amount of spectrum available for service providers. The major difference between the two policies is that the spectrum set-aside keeps existing service providers from bidding on a distinct block of spectrum with certainty, while spectrum aggregation limits keep existing service providers from bidding only to the extent that the aggregation limit is binding.

11. If mandated roaming is imposed as well, then this will create a wireless firm that was able to circumvent the majority of market forces that the existing service providers had to face. Firms that are granted significant protection will tend to require on-going regulatory protection, since the benefits of regulatory dependence tend to outweigh the costs of making the necessary investments that would allow them to become more effective competitors.

12. In general, government intervention is blunt and hence difficult to keep narrowly focused. The greater the extent of government intervention, the greater the chances of having overlapping or redundant policies which can result in outcomes that do not make society better off. The distortions caused by intervention can be compounded unless policy makers can perfectly account for all of the various ways the policies interact, which in reality is impossible to achieve because of asymmetric information. As noted by Cramton (2002):

Modifications to the rules should be considered carefully. The various rules interact in often subtle ways. An apparently innocent change can have disastrous consequences. The interaction between waivers and the

¹¹ Industry Canada, "Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services," DGTP-002-07, February 2007, "Part II(2): Fostering a Competitive Wireless Market," page 23.

¹² *Ibid.*, page 24.

declining schedule of minimum opening bids in the Dutch UMTS auction is an example.¹³

13. Canada is not the first jurisdiction to consider these issues. An overview of the international experience is provided in a report prepared by Gilbert+Tobin titled *Spectrum Allocation Processes: A Review of Global Experience* which concludes:

Ultimately, none of the various mechanisms intended to either foster the ideal conditions of entry for a new market entrant, or to generally promote competition in markets reliant on allocation of spectrum, can be said to have had the intended effect, without causing other market distortions, or without requiring further ongoing monitoring or associated regulatory measures to ensure that market distortions do not result.¹⁴

14. Industry Canada correctly recognizes that government intervention through entry-assisting policies must be done with caution because of the efficiency costs that can be introduced into a competitive market. Thus, Industry Canada must examine whether the costs of not taking action to enable entry (i.e. potential benefits of increased competition) are greater than the costs of facilitating entry (i.e. potential of fostering inefficient entry).

15. The Canadian wireless sector is well established and the state of competition is such that government intervention through the use of entry-assisting policies is not required. It is not clear that any potential benefits due to potentially increasing competition through the use of policies that assist entry are greater than the potential costs of inefficiently distorting the auction mechanism, facilitating inefficient entry, or simply subsidizing firms that do not require them.

16. The remainder of the report is organized as follows. Section 2 provides a brief discussion regarding the current state of competition in the Canadian wireless sector and determines that government intervention to increase competition is not required, especially if the entry-assisting policies result in inefficient distortions in the market. Section 2 also points out that any concerns about future firm behaviour can be addressed by existing legislation through the *Competition Act* and the

¹³ Cramton, P, (2002), "Spectrum Auctions," *Handbook of Telecommunications Economics*, Vol.2, Cave, Majumdar and Vogelsang, eds., New York: Elsevier, 605-639, page 631.

¹⁴ Gilbert+Tobin, *Spectrum Allocation Processes – A Review of Global Experiences*, 25 May 2007, Appendix 3 of Bell Canada's submission with respect to Industry Canada's *Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services*, page 14.

Telecommunications Act. These two points together indicate that the potential benefits of assisting entrants in the Canadian wireless sector are small. Section 3 argues that the potential efficiency costs of distorting the auction process and facilitating inefficient entry can be large. As well, to the extent there is potential future anticompetitive behaviour, reliance on the *Competition Act* is a less intrusive measure than *ex ante* government regulation. Section 4 concludes that Industry Canada must carefully examine whether the benefits of assisting entry are significantly greater than the efficiency costs of constraining the auction process and imposing *ex ante* regulation.

2. COMPETITION CONCERNS

2.1 Competition in the Canadian Wireless Market

17. The entry-assisting policies being contemplated by Industry Canada are designed to address the belief that the Canadian wireless sector can be made more competitive. However, given the current extent of competition in the Canadian wireless sector, government intervention is not warranted. Some may argue that the mere fact that there is only a small number of large firms operating in the market is an indication that the market is not effectively competitive. However, the number of firms offering service in the market is not a sufficient condition for determining the extent of competition. For example, when determining the extent of market power the Competition Bureau examines many factors including market share (stability and distribution), barriers to entry, conduct by alleged dominant firms, technological change, extent of excess capacity, and customer or supplier countervailing power.¹⁵

18. Given the large fixed costs associated with providing a facilities-based wireless network, only a limited number of firms will be able to profitably enter using a facilities-based model. For example, as each new firm enters the market, industry profits decline due to increased competition. Since profits decrease with the addition of each new entrant, there will be a point in which the profits an entrant earns will be less than the fixed costs of entering. After this point, additional entry will be unprofitable. Thus, the

¹⁵ Commissioner of Competition, *Enforcement Guidelines on the Abuse of Dominance Provisions*, (2001) at page 14. Available electronically at <http://www.competitionbureau.gc.ca/internet/index.cfm?itemID1251&lg=e>.

larger the fixed costs, the smaller the number of firms that can profitably operate in the market.

19. The number of firms that can efficiently operate in the market will depend on the relationship between minimum efficient scale of production (MES) and total demand.¹⁶ If in order to achieve the minimum cost of production requires producing a level of output that is a large fraction of total demand, and the product is not readily exportable, then only a small number of firms will be able to reach the lowest cost level of production. This explains why Canada tends to have more concentrated industries relative to the United States, because in general, the level of output required to reach MES in Canada will be a larger fraction of total demand than in the U.S.

20. Industry Canada has also indicated that large fixed costs can be a barrier to entry.¹⁷ While large fixed costs limit the number of firms that can efficiently operate in a market, it does not indicate that there will be competition concerns. As argued by Posner (1976):

Economies of scale do not create a barrier to entry; they only dictate the level of output that the new entrant must achieve in order to minimize his costs. The amount of capital required for entry is not a barrier to entry either; presumably it is no greater for the new entrant than for the firms in the market.¹⁸

21. Furthermore, the Canadian Competition Tribunal has argued that economies of scale alone are not a barrier to entry. The Competition Tribunal states in *Southam*:

Economies of scale without sunk costs are not enough either. Although a struggle for customers needed to achieve adequate scale will take place, by definition the entrant has nothing to lose if there are no sunk costs. If the entrant attempt does not succeed, the entrant has merely to sell the assets invested in the attempt and walk away.¹⁹

22. While economies of scale alone are not a barrier to entry, the best approach to the issue is to not worry about what is, or is not a barrier, but rather to focus on whether

¹⁶ Minimum Efficient Scale is the level of output where average cost is minimized and economies of scale are exhausted.

¹⁷ Industry Canada, "Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services," DGTP-002-07, February 2007, page 19.

¹⁸ Posner, R.A., (1976), *Antitrust Law: An Economic Perspective*, Chicago: The University of Chicago Press, page 92.

¹⁹ *Director of Investigation and Research v. Southam Inc.*, (1992), 43 C.P.R. (3d) 161, at 281.

a policy can improve total surplus. This approach is supported by Viscussi, Vernon and Harrington (2000):

The best advice we can offer is to perform a two-stage inquiry. In the first stage, carefully examine whether it is indeed true that existing firms can maintain price above cost while deterring entry. In the second stage, consider whether there is a policy that could "remove" the barrier and improve social welfare.²⁰

23. It is important to note that the degree of competition has led to a decline in government oversight in the wireless market. In Telecom Decisions 94-15²¹, 96-14²², and 98-18²³, the Canadian Radio-television and Telecommunications Commission ("CRTC") forbore from regulating mobile wireless services on the basis that such services were sufficiently competitive. This view has been reaffirmed by the CRTC in Decision 2006-33:

... In *Application by Microcell regarding alleged contraventions of section 27(2) of the Telecommunications Act by Rogers Wireless and Bell Mobility*, Telecom Decision CRTC 2003-26, 28 April 2003, the Commission considered that the wireless market was characterized by rivalrous behaviour and was robustly competitive. The Commission considers that this assessment continues to be valid with respect to the current state of competition in the wireless market. In this regard, the Commission notes that in its *Report to the Governor in Council: Status of Competition in Canadian Telecommunications Markets, October 2005*, the Commission reported that the wireless market continued to display strong growth and to be competitive.²⁴

24. The wireless sector also exhibits technological change and product innovation. As described by the CRTC:

In addition to voice communication over wireless networks, new technologies and applications in wireless are used to send text messages from one subscriber to another, as well as multi-media messages which include photos, graphics, video and audio clips. Inter-carrier text messaging has been in place for the last few years. The reach of picture and video messaging services continues to expand following the introduction of full inter-carrier multi-media messaging on 1 July 2005.

²⁰ Viscussi, W.K., J.M. Vernon, and J.E. Harrington, (2000), *Economics of Regulation and Antitrust*, 3rd Ed., Cambridge: The MIT Press, page 160. See also OECD, (2007), "Competition and Barriers to Entry," *Policy Brief*, and Directorate for Financial Enterprise Affairs Competition Committee, (2006), *Barriers to Entry*, OECD DAF/COMP(2005)42.

²¹ Telecom Decision CRTC 94-15 *Regulation of wireless services*.

²² Telecom Decision CRTC 96-14 *Regulation of mobile wireless telecommunications services*.

²³ Telecom Decision 98-18 *NBTel Inc. – Forbearance from regulating cellular and personal communications services*.

²⁴ CRTC Telecom Decision 2006-33, *Part VII application by Superior Wire Inc. against TBayTel alleging unjust discrimination*, paragraph 29.

Other services are increasingly being offered to wireless subscribers. For example, on 8 November 2005, the national wireless service providers announced a joint venture to develop a standard common way of making payments over the wireless network. This service is expected to be launched during the third quarter of 2006.²⁵ [footnotes omitted]

25. Industry Canada has indicated that "a Bureau decision not to challenge a merger should be viewed independently from a Department policy decision of using set-asides, aggregation limits or other measures designed to provide an opportunity for new entry to facilitate a more competitive market over what may currently exist."²⁶ However, the analysis conducted by the Competition Bureau provides additional insight to the extent of competition in the Canadian wireless sector. The Competition Bureau determined that the removal of Microcell would not substantially lessen competition in the Canadian wireless sector:

There were a number of factors behind the Bureau's finding that there would continue to be vigorous and effective competition remaining following the merger, some of which included the introduction of a variety of new plans that combine minutes of use, handsets, service features and prices; the ability of competitors to add new customers, and; the willingness of Bell Mobility, Rogers and Telus Mobility to respond to price changes by other and to go after each others' territories. This finding is consistent with several decisions involving forbearance from regulation in the mobile wireless market in Canada by the CRTC where it determined that these markets are competitive.²⁷

26. With respect to the concern that with fewer firms in the market it is easier to coordinate market behaviour to the detriment of consumers, the Competition Bureau found that the characteristics of the wireless market did not facilitate such behaviour. The Competition Bureau states:

... the Bureau's analysis determined that there were other important conditions present that diminish the likelihood of effective coordination from developing. As noted, the mobile wireless services market is in a period of rapid growth which is likely to continue for a number of years as Canada's penetration rate for mobile telecommunications rises. There is a greater impetus for wireless providers to capture as much market share when the market is growing in an effort to secure long term customer loyalty. As a result, there is significant disincentive for industry participants to act in a coordinated fashion.

²⁵ CRTC, *Status of Competition in Canadian Telecommunications Markets*, 2006, page 77.

²⁶ Industry Canada, "Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services," DGTP-002-07, February 2007, page 18.

²⁷ Competition Bureau Canada, *Acquisition of Microcell Telecommunications Inc. by Rogers Wireless Communications Inc.*, available electronically at <http://www.competitionbureau.gc.ca/internet/index.cfm?itemID=257&lg=e>.

Markets with rapid and frequent product or service innovations are less conducive to coordinated behaviour. It is much harder to act in a coordinated fashion when competitors worry that their rivals might be ready to launch the next new "killer application". This is further compounded in this market because of the differences in the underlying technological platforms. It was the Bureau's view that this is a dynamic industry which is still evolving rapidly. There is a high degree of technological change and innovation, as reflected by the number of new product and service launches over the past number of years.

A further factor that was considered important in the Bureau's review was the history and nature of competition between the remaining competitors in this market and in other markets. Evidence suggested that the majority of competitive price reactions by a competitor in the mobile telecommunications market were prompted by the actions taken by Rogers, Bell or Telus, as opposed to actions taken by Microcell. This conclusion is reinforced by the nature of competition between these competitors in other telecommunications and broadcast distribution markets.²⁸

27. The findings of CRA International are consistent with those of the CRTC and the Competition Bureau regarding the state of competition in the Canadian wireless sector. CRA International concludes that:

In summary, using the well-established analytical framework embodied in Canadian competition law, we find that no single wireless firm in Canada has substantial market power. As well, we find that cooperative arrangements among the existing wireless providers to exercise substantial market power jointly are highly unlikely. Thus, given the issues being examined in Industry Canada's consultation process, we find no clear evidence for concerns regarding the state of competition in the Canadian wireless market.²⁹

28. The CRTC has already decided quite some time ago that economic regulation is no longer required, and the Competition Bureau's analysis of the market is consistent with the determination of the CRTC. Therefore, given the current state of competition in the Canadian wireless sector, there is no need for the government to intervene to make the market "more" competitive. Industry Canada should continue to rely on market-forces in the wireless market, especially if the policies designed to create more

²⁸ Ibid.

²⁹ CRA International, *An Assessment of Market Power in the Provision of Wireless Telecommunications Services in Canada*, 25 May 2007, Appendix 1 of Bell Canada's submission with respect to Industry Canada's *Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services*, page 41.

competition result in inefficiencies in the market and unnecessary additional government regulations.

2.2. Existing Legislation

29. To the extent that there remain concerns about future firm behaviour, these can be addressed under existing legislation; mainly the *Competition Act* and the *Telecommunications Act*. The *Competition Act* is a statute of general application, with certain specific legislative exclusions (such as collective bargaining, amateur sports and certain banking activities). In general, the purpose of the *Competition Act* is to maintain and encourage competition in the Canadian marketplace. The *Competition Act* provides the Competition Bureau with the right to review and contest mergers, to address potentially anti-competitive business practices and to enforce its criminal provisions such as conspiracy, price-fixing and market allocation.

30. Under the *Competition Act*, a finding of an abuse of a dominant position requires three key elements: (i) a (or several) dominant firms in a given market; (ii) a practice of anti-competitive acts; and (iii) substantial harm to competition. Dominance is interpreted as the ability to profitably set prices (or other non-price factors of competition) above competitive levels for a considerable period of time (typically at least a year) and substantial harm to competition will focus on the degree to which the anti-competitive acts enhance or preserve market power.

31. It should be noted that substantial harm to competition is also a key element of the *Competition Act's* merger provisions, under which the analysis focuses on whether the merger will substantially grant market power upon the merging parties. As noted above, the Competition Bureau recently reviewed the acquisition of Microcell by Rogers and did not find that it substantially harmed competition. Thus, it can be drawn from this merger review in 2004 that the Competition Bureau did not believe that Rogers had meaningful market power. Moreover, since that time there has been no significant structural change in the wireless sector, which implies that this conclusion should not change.

32. There should also be no concern that the *Competition Act* will not be effective in policing the wireless sector. First, the Competition Bureau has recent experience in analyzing the wireless sector based on their review of the Microcell-Rogers transaction. Second, the Competition Bureau is dedicated to examining competition in all industries including telecommunications markets that have been forborne. To that end, the Competition Bureau has recently released the *Draft Information Bulletin on the Abuse of Dominance Provisions as Applied to the Telecommunications Industry*.³⁰ Third, to the extent that there is a concern about the amount of resources the Competition Bureau has at its disposal, the Industry Minister recently announced an increase of \$10.5 million to the Competition Bureau's budget over the next five years specifically for the oversight of the telecommunications industry.³¹

33. Moreover, even though the CRTC has forborne from economic regulation, it has retained the jurisdiction to ensure that wireless providers do not unjustly discriminate or confer any undue or unreasonable preference. In particular, the CRTC noted in Telecom Decision 96-14 that "open access to telecommunications networks to be in the public interest" and that it was necessary that the CRTC ensure that "providers of these [wireless] services do not unjustly discriminate against other service providers or subscribers, or confer any undue or unreasonable preference, with respect to access to their networks."

34. It is also important to note that government policy concerns in the telecommunications industry can be addressed by the CRTC, and that the CRTC has shown that it is willing to intervene in the wireless market in order to improve competitive dynamics. For example, the implementation of wireless number portability was a key objective of the Minister of Industry and, as a result, Telecom Decision CRTC 2005-72 *Implementation of wireless number portability* required that Canadian wireless service providers implement wireless number portability by March 14, 2007:

In a letter dated 18 March 2005, the Minister of Industry informed the Commission that the Budget Plan tabled in Parliament on 23 February

³⁰ Competition Bureau Canada, *Draft Information Bulletin on the Abuse of Dominance Provisions as Applied to the Telecommunications Industry* available electronically at <http://www.competitionbureau.gc.ca/internet/index.cfm?itemID=2180&lg=e>.

³¹ Government of Canada, 4 April 2007, "Canada's New Government Accelerates Deregulation of Local Telephone Service to Benefit Canadian Consumers," Industry Canada. [Accessed May 23, 2007 at <http://www.ic.gc.ca/cmb/welcomeic.nsf/261ce500dfcd7259852564820068dc6d/85256a5d006b9720852572b400524ba5!OpenDocument.>]

2005 made reference, among other things, to the Government of Canada's intention to request the Commission to move expeditiously to implement WNP. The Minister noted that consideration of WNP was included in the Commission's three-year work plan, and was therefore confident that the Commission would deal with this matter in an expeditious manner.³²

35. Furthermore, the type of intervention being considered by Industry Canada presumes the finding of anti-competitive behaviour. However, the finding of anti-competitive behaviour is exactly what the *Competition Act* was designed to address. Thus, to the extent that there remain any concerns about future firm behaviour, these can be addressed by existing legislation through the *Competition Act* and the *Telecommunications Act*, and there is no need for additional government oversight.

3. ENTRY-ASSISTING POLICIES

36. Industry Canada must carefully weigh the potential benefits against the potential efficiency costs of imposing entry-assisting policies. In determining the extent of potential benefits, it needs to consider the state of competition, the potential asymmetries between existing and new wireless service providers, and the ability to profitably engage in anti-competitive behaviour. In determining the extent of potential efficiency costs, Industry Canada needs to consider the impact of altering the auction process and the effect of *ex ante* intervention on market dynamics.

37. Industry Canada has suggested three potential remedies to help alleviate competition concerns: (i) spectrum set-asides; (ii) spectrum aggregation limits; and (iii) mandated roaming. Based on the current state of competition in the Canadian wireless sector, and the existing legislation already in place to monitor firm behaviour, the potential benefits of assisting entrants is small. As a result, Industry Canada must carefully consider the potential efficiency costs of spectrum set-asides, aggregation limits, and interfering with market transactions on an *ex ante* basis through the implementation of mandated roaming.

³² Telecom Decision CRTC 2005-72, *Implementation of wireless number portability*, paragraph 2.

38. Given the benefits associated with the auction process, it is important to make sure that the auction rules are not changed to such an extent that it becomes difficult to distinguish the results from those that would occur with other methods of assigning licenses such as a comparative review process. Though some might think it is desirable to protect firms at an early stage of entry, protecting an industry, once engaged, can be never ending. Generally, protected firms do not have an incentive to make the necessary investments that would result in them becoming more effective competitors since they do not face the full competitive pressure from existing firms. Furthermore, more is not always better. The market outcome is not necessarily improved by the addition of new firms. The type of firm matters such that the entry of inefficient firms will reduce the efficiency of the market.

39. Industry Canada correctly recognizes that government intervention through the use of entry-assisting policies must be done with caution. Hence, the full benefits and costs must be considered before a policy is put into place. As Industry Canada states:

Not taking explicit action to enable entry may therefore have the consequence of preventing entry while taking explicit action runs the risk of potentially enabling uneconomic entry. Since there is no way to forecast market forces at play with accuracy, the Department must consider on a *balance of probabilities*, which approach is most in the public interest. This would take into account factors such as: current market structure; market rivalry; pricing; expressed demand for the spectrum in question; and the potential for incumbents to preclude market entry by acquiring all of the spectrum available.³³

40. Any potential benefits of entry assistance will depend on the extent to which there exists a significant asymmetry between existing service providers and new entrants. With respect to the wireless sector, these asymmetries can arise from three potential sources: (i) economies of scale and scope; (ii) experience in operating wireless services; and (iii) demand complementarity between new and existing services.³⁴

³³ Industry Canada, "Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services," DGTP-002-07, February 2007, page 21.

³⁴ A demand complementarity exists between two goods if the demand for good one increases as the amount of good two increases. Thus, there is a demand complementarity between new and existing service if the demand for new services increased with an increase in the amount of existing services available.

41. First, on the supply side, economies of scale and scope, and experience in operating wireless services can create an asymmetry between new and existing firms. However, existing firms should not be penalised and the benefits should not be wasted. There are a number of factors in addition to the large fixed costs of network deployment that can result in economies of scale and scope such as consumer demand for seamless roaming, a reduction with the problem of boundary interference, local advertising, network management, and consumer demand for the use of wireless services in more areas. As a result, encouraging small scale entry may be an inefficient use of resources. This issue is highlighted by Cramton (2002):

Special treatment to designated entities is to some extent premised on the idea that small is beautiful. But what we have learned in the last several years is that there are significant scale economies in wireless communications. Part of the scale economy is the bargaining advantage it creates with equipment suppliers. Another part is scale economies in marketing. But perhaps the largest is the value that consumers place on seamless roaming. As a result, the marketplace has shifted toward nationwide services in most wireless categories. These nationwide services are necessarily billion dollar deals, or tens-of-billions in the case of broadband mobile services. What consumers need is a variety of strong national competitors. In many cases, the small regional players cannot compete. The designated entity rules may simply be setting up the small businesses for failure.³⁵

42. Second, on the demand side, while new services will be substitutable for existing services, it is not necessarily the case that existing services will be effective substitutes for new ones. As a result, the fact that existing service providers have existing spectrum allocations will not provide them with a significant advantage over a new entrant.

43. Furthermore, before government intervention is implemented to remedy any potential anti-competitive behaviour, firm behaviour must be analysed with respect to whether it is in a firm's best interest to engage in such conduct. The ability for existing firms to profitably deter entry will depend on the relationship between three factors: (i) profits of existing firms with and without new entry; (ii) the profits of the new entrant; and (iii) the fixed costs of entry. Consider the following illustrative example where there currently exists a service provider (Firm 1) and as a result of additional inputs being

³⁵ Cramton, P. (2002), "Spectrum Auctions," *Handbook of Telecommunications Economics*, Vol.2, Cave, Majumdar and Vogelsang, eds., New York: Elsevier, 605-639, page 634.

made available to the market through an auction, there is the possibility of entry by a new service provider (Firm 2). The value to Firm 1 of being able to deter entry is the profits that occur if it deters entry minus the profits that occur if there is entry by Firm 2. This implies that Firm 1 will be able to profitably deter entry only if this difference is greater than the fixed cost of inefficiently outbidding Firm 2. Thus, the smaller the difference between profits with and without entry, the more difficult it is to profitably deter entry, because it is more difficult to recover the cost of inefficiently outbidding Firm 2.³⁶

44. As well, the benefits of outbidding an entrant are dubious especially if outbidding puts one firm at a significant cost disadvantage relative to other existing firms in the market. No one firm can afford to significantly increase its costs relative to the other firms operating in the market and still remain competitive. A firm will not want to spend hundreds of millions of dollars more than its rivals in order to acquire spectrum which it will not put to productive use. Using spectrum in an inefficient manner relative to other firms will put a firm at a significant competitive disadvantage. In fact, the incentives may work in the opposite direction such that firms will launch services faster in order to recoup their auction costs than if the spectrum had been given away.

45. This raises the issue of whether existing firms can coordinate their behaviour in order to collectively deter entry. Entry prevention in this situation has the same characteristics as a "public good" such that all firms benefit from a decrease in competition even if only one firm pays for it.³⁷ That is, if any one firm outbids the entrant in order to deter entry, all firms are protected from additional competition. Thus, each firm has an incentive to "free-ride" on the entry preventing activities of its competitors in order to avoid increasing its costs relative to its rivals.

46. Given the explicit cost of outbidding the potential entrant and the implicit cost of decreasing its competitiveness relative to its rivals, firms have little incentive to bid for spectrum capacity that will not be used in a productive manner. Moreover, there will

³⁶ Note that profitable entry by Firm 2 requires that the duopoly profits are greater than the cost of acquiring the input in the auction.

³⁷ A pure public good is nonrivalrous (consumption by one agent does not reduce the possibilities of consumption by other agents), and are not subject to exclusion. A standard example is national defence.

continue to be new spectrum being made available and technology will continue to advance. This increases the costs of anti-competitive behaviour since firms will have to deter entry whenever new spectrum is made available or new technologies are deployed.

47. Finally, while theoretical in nature and difficult to prove *ex ante*, Industry Canada must consider that assisting additional entry may not increase social welfare because the new entrant does not increase quantity or reduce prices to the extent necessary to justify the duplication of fixed cost, let alone the additional costs of subsidizing entry. This issue is summarized by Berry and Waldfogel (1999):

Excessive entry can result when two conditions hold: first, entrants' products are substitutes for existing firms' products, so that entry "steals business" from incumbents; second, average costs are decreasing in output. An extreme example, with perfect substitutes, fixed prices, and exclusively fixed costs, illustrates this clearly. A second entrant garners half of the market and halves the incumbent's output. Consumers derive no additional benefit from the entrant's product [due to the fixed prices], but resource use on fixed costs is now doubled, reducing social surplus. The logic of free entry dictates that firms enter as long as the private benefit accruing to an entrant exceeds fixed costs. When new products are substitutes for existing products, the business stolen from incumbents places a wedge between private and social benefits of entry. In general, the business-stealing effect can be offset if entry reduces prices or increases available product variety, so that entry can be either excessive or inefficient.³⁸ [footnotes omitted]

48. Thus, there are no clear benefits of creating and implementing entry-assisting policies, given the competitive nature of the wireless sector, the monitoring role of existing legislation, the lack of asymmetries that require government intervention to correct, and the difficulty of engaging in profitable anti-competitive behaviour. As a result, Industry Canada must carefully consider the potential efficiency costs of imposing entry-assisting policies.

³⁸ Berry, S.T., and J. Waldfogel, (1999), "Free Entry and Social Inefficiency in Radio Broadcasting," *RAND Journal of Economics*, 30(3):397-420, pages 397-398.

3.1 SPECTRUM SET-ASIDES

49. The purpose of the spectrum set-aside is to restrict the participation of current wireless service providers on a specified frequency block. However, set-asides can also create a number of potential inefficiencies. First, the fact that a firm is guaranteed spectrum introduces the possibility that an inefficient firm will enter the market. With perfect information, Industry Canada could, in principle, be able to induce the type of market structure it considers to be appropriate. However, this requires that the government have perfect information concerning how each potential licensee is going to use the spectrum. If Industry Canada's information is imperfect and there are not enough licenses, then set-asides can result in an inefficient allocation of licenses because spectrum could be allocated from an efficient firm to an inefficient firm. The difficulty in creating appropriate set-asides is noted by Cramton (2002):

... set-asides and bidding credits have serious potential problems. Gauging the right level of set-asides or bidding credits is extremely difficult. Also, it is nearly impossible to target the favour to the desired group.³⁹

50. Second, in auctions with common value assets and correlated (or affiliated) information, a phenomenon called the "Winner's Curse" often exists.⁴⁰ That is, winning an auction can have negative consequences for the winner since it indicates that the winner estimated the value of the asset more aggressively than the other bidders. As a result, the winner finds out *ex post* that the asset it won is not as valuable as it expected prior to the auction.

51. In the context of auctions with common-value assets and a high degree of uncertainty, as is the case with spectrum auctions, the Winner's Curse problem has two implications. First, there is a significant chance that the *ex post* value of the asset is not sufficiently large to recover the expense of the winning bid, in which case the winner may have to declare bankruptcy. As noted by Varian (2003):

³⁹ Cramton, P, (2002), "Spectrum Auctions," *Handbook of Telecommunications Economics*, Vol.2, Cave, Majumdar and Vogelsang, eds., New York: Elsevier, 605-639, page 635.

⁴⁰ In a pure common-value asset model, the actual value of the asset is the same for everyone, but bidders have different private information about what that value actually is, and loosely speaking, bidder's signals are correlated or affiliated if a high value of one bidder's signal makes high values of other bidders' signals more likely. That is, if one firm puts in a high bid on one spectrum license, then it is more likely that similar high bids will be placed on similar spectrum licences.

- The Winner's Curse seemed to be operating in the FCC's May 1996 spectrum auction for personal communication services. The largest bidder in that auction, NextWave Personal Communications Inc., bid \$4.2 billion for sixty-three licenses, winning them all. However, in January 1998 the company filed for Chapter Eleven bankruptcy protection, after finding itself unable to pay its bills.⁴¹
52. The Winner's Curse problem also arose in the United Kingdom. As noted in the report prepared by Gilbert+Tobin:
- In the UK, setting aside the largest 3G license for a new entrant generated significant interest among new entrants in the relevant spectrum, however, this level of interest led to irrational bidding and the new entrant (BT) exited the market by divesting the spectrum to O2.⁴²
53. Second, by separating the auctions and reducing the amount of information available to bidders, the presence of the Winner's Curse tends to reduce the revenue that a seller (in this situation Industry Canada) could generate from the auction. To the extent that firms realize the potential for the Winner's Curse, they have an incentive to lower bids in an attempt to keep from bidding more than the true value license and going bankrupt. With firms decreasing their bids, government revenue is reduced.
54. The impact of the Winner's Curse varies depending on the type of auction mechanism used, with the Winner's Curse problem being more severe in sealed-bid auctions than in open-bid auctions.⁴³ The auction mechanism used previously by Industry Canada is a simultaneous, multiple-round auction referred to as a simultaneous ascending auction. The multiple-round feature means that bidding in the auction is organized into a series of discrete rounds with time between rounds that allow bidders to review the results from the previous rounds. At the beginning of each round, bidders are provided with all the relevant information including the bids placed by all bidders and the level of each bidder's eligibility for bidding in the next round.⁴⁴ The use of multiple rounds takes advantage of the well-known linkage principle in auction

⁴¹ Varian, H.R., (2003), *Intermediate Microeconomics: A Modern Approach*, Sixth Edition, W.W. Norton & Company, page 317.

⁴² Gilbert+Tobin, *Spectrum Allocation Processes – A Review of Global Experiences*, 25 May 2007, Appendix 3 of Bell Canada's submission with respect to Industry Canada's *Consultation on a Framework to Auction Spectrum in the 2GHz Range including Advanced Wireless Services*, page 4.

⁴³ Milgrom, P.R. and R.J. Weber, (1982), "A Theory of Auctions and Competitive Bidding," *Econometrica*, 50:1089-1122.

⁴⁴ For more detailed information, see *Framework for Spectrum Auctions in Canada*, 2001 available at [http://strategis.ic.gc.ca/epic/site/smt-gst.nsf/vwapj/framework-e.pdf/\\$FILE/framework-e.pdf](http://strategis.ic.gc.ca/epic/site/smt-gst.nsf/vwapj/framework-e.pdf/$FILE/framework-e.pdf).

theory which suggests that the revelation of affiliated (or correlated) information by the seller and bidders in the auction process helps reduce the Winner's Curse problem.⁴⁵ The simultaneous ascending auction format allows each bidder to review and learn from other bids, and by aggregating dispersed information from other bidders, each bidder will be able to place its bid more accurately. This reduces the Winner's Curse problem and the probability of bankruptcy while increasing the auction revenue for the government.

55. However, a set-aside policy separates existing carriers from new entrants in competitive bidding, which in turn reduces the amount of information revealed in each auction and lowers the efficiency of the auction mechanism. Relative to existing firms, new firms do not have as much information about the nature of the wireless sector and their estimates of the spectrum asset values will tend to be less accurate. Hence, new firms are more likely to suffer from the Winner's Curse problem in auctions with set-asides.

56. This aggressive bidding by new entrants occurred in the 1995 U.S. auction for mobile licenses. As noted by Klemperer (2002):

While the [Los Angeles license] value was hard to estimate, it was probably worth similar amounts to several bidders. But Pacific Telephone, which already operated the local fixed-line telephone business in California, had distinct advantages from its database on potential local customers, its well-known brand-name and its familiarity with doing business in California. The auction was an ascending one. The result was that the bidding stopped at a very low price. In the end, the Los Angeles license yielded only \$26 per capita. In Chicago, by contrast, the main local fixed-line provider was ineligible to compete, and it was not obvious who would win, so the auction yielded \$31 per capita even though Chicago was thought less valuable than Los Angeles because of its lower household incomes, lower expected population and more dispersed population.⁴⁶

57. Third, correction of flawed policy by market forces is not costless. Not only are there the usual transaction costs associated with the transfer of assets (e.g. costs of obtaining regulatory approval from the Competition Bureau, or the CRTC, or Industry

⁴⁵ Milgrom, P.R. and R.J. Weber, (1982), "A Theory of Auctions and Competitive Bidding," *Econometrica*, 50:1089-1122, page 1110.

⁴⁶ Klemperer, P., (2002), "What Really Matters in Auction Design," *Journal of Economic Perspectives*, 16:169-189, page 173.

Canada, or some combination of the three), there are also other costs to society that should not be ignored such as delays in the deployment of spectrum. For example, in the C-Block auction bankruptcies, 30 MHz of spectrum was not put into service while the legal system sorted out the transfer of assets. As stated by Hazlett and Muñoz (2006):

If additional licenses for cellular services had been allowed to utilize another 30 MHz of radio spectrum, consumer surplus (excluding supply-side effects) over the eight year period, 1996-2003, would have increased by an estimated \$31.2 billion (using 2004 dollars). ... This dominates any plausible public financing gains from tinkering with auction design. In fact, aggregate revenues collected from all U.S. wireless licenses, 1994-2002, amounted to just \$14 billion.⁴⁷ [footnotes omitted]

58. A similar analysis was conducted by Wilkie (2004) which shows that the costs of delaying the use of spectrum are significant.⁴⁸ Table 1 presents the loss in consumer surplus as a result of spectrum not being fully allocated in the market. The first row shows that if the price elasticity of demand is -1.00, then not deploying 30 MHz of spectrum results in a \$16.6 billion annual loss in consumer surplus, or a \$64.1 billion present discounted value loss over a 10-year period. The next two columns show the loss if only 15 MHz of spectrum are not deployed.

⁴⁷ Hazlett, T.W. and R.E. Muñoz, (2006), "A Welfare Analysis of Spectrum Allocation Policies," *George Mason University Law and Economics Research Paper Series* 06-28, page 23.

⁴⁸ Wilkie, S.J., *Declaration of Simon J. Wilkie*, 30 July 2004, Federal Communications Commission Docket No. DA 04-1639, Report No. AUC-03-58-A.

TABLE 1
LOSS IN CONSUMER SURPLUS DUE TO C-BLOCK AUCTION

| Price Elasticity of Demand | Assuming No C-block Spectrum Deployed ¹ | | Assuming One-half of C-block Spectrum Deployed ² | |
|----------------------------|--|--|---|--|
| | Annual Loss in Consumer Surplus (\$ Billions) | Present Value of Loss in Consumer Surplus (\$ Billions) ³ | Annual Loss in Consumer Surplus (\$ Billions) | Present Value of Loss in Consumer Surplus (\$ Billions) ³ |
| -1.00 | 16.6 | 64.1 | 8.3 | 32.0 |
| -1.25 | 13.5 | 52.2 | 6.8 | 26.1 |
| -1.50 | 11.4 | 44.1 | 5.7 | 22.1 |
| -1.75 | 9.9 | 38.1 | 5.0 | 19.1 |
| -2.00 | 8.7 | 33.6 | 4.4 | 16.8 |
| -2.25 | 7.8 | 30.0 | 3.9 | 15.0 |
| -2.50 | 7.0 | 27.1 | 3.5 | 13.6 |

1. 30 MHz of spectrum not being deployed.

2. 15 MHz of spectrum not being deployed.

3. Present discounted value as of 1996 for a period of 10 years.

Source: Wilkie, S.J., *Declaration of Simon J. Wilkie*, 30 July 2004, Federal Communications Commission Docket No. DA 04-1639, Report No. AUC-03-58-A, page 16.

59. Fourth, to the extent set-asides artificially reduce the capacity of firms, they reduce the benefits of economies of scale and scope in the provision of wireless services. As noted above, there are significant benefits to having large national providers of wireless services. Thus, promoting entry of smaller firms is incompatible with the industry trend towards firms with a national reach.

60. Similarly, demand for new services will require a significant amount of spectrum and because of problems related to boundary interference, there are technological economies of scale with respect to spectrum holdings. For example, a firm operating a network in a market with 20 MHz of spectrum can serve more customers or offer higher quality service than two firms with 10 MHz each, because the single firm will not have to consume valuable spectrum by using guard bands to protect its services from natural interference caused by neighbouring firms using adjacent spectrum. Furthermore, offering small geographic licenses can reduce the probability of efficient license aggregation by firms trying to achieve economies of scale and scope.

61. Finally, one major benefit of using auctions is that it creates competition among license participants such that firms with the highest value for the spectrum tend to bid higher than other firms and win the license. However, the set-aside policy divides the

number of competing firms into two groups and auctions off the two groups of licenses separately. This limits competition in both sets of auctions and does not realize the full revenue benefits of using an auction mechanism to allocate spectrum licenses.

62. Some may argue that reducing the supply of spectrum available for existing service providers will increase the revenue generated in that auction, which could then be used to offset any decrease in revenue that would result from reduced competition in the set-aside auction. However, such an outcome would be purely coincidental because the two auctions are separate, and would be an implicit subsidy from existing service providers to the participants in the set-aside auction. Regardless as discussed above, set-asides can result in significant efficiency costs in the Canadian wireless sector.

63. While the U.S. experience has demonstrated the costs of constraining the auction mechanism, it has also demonstrated the benefits of using an unconstrained auction. As described by Michael Gallagher:

Under FCC Chairman Martin's leadership, 104 bidders won 1,087 licenses resulting in gross bids of \$13.9 billion – the largest completed auction to date. The AWS auction exemplified the key criteria for a successful auction. Licensing was open, simple, and transparent with no market-impacting conditions. Due to that auction structure, the U.S. will enjoy the introduction of another nationwide wireless competitor – the cable industry – who purchased licenses covering nearly the entire country.⁴⁹

3.2 SPECTRUM AGGREGATION LIMITS

64. The spectrum aggregation limit is designed to prevent the concentration of spectrum by any single firm, and to reduce the possibility that an existing firm could inefficiently outbid other firms and keep them from acquiring necessary spectrum. However, the same issues that arise with spectrum set-asides apply to spectrum aggregation limits. Industry Canada will require very precise information about the future operational plans of all firms in the market in order to create a sensible cap on capacity. If the spectrum cap is too low, then new and existing services may not be

⁴⁹ Testimony of Michael D. Gallagher before the United States House of Representatives Committee on Energy and Commerce Subcommittee on Telecommunications and the Internet, hearing on "The Digital Future of the U.S.: Part 3: Spectrum Opportunities and the Future of Wireless," page 6.

deployed in the most efficient manner. If the spectrum cap is too high, then it has no effect on the market and is not necessary.

65. Furthermore, the spectrum cap that was instituted in 1995 was eliminated by Industry Canada in 2004.⁵⁰ Part of the reasoning behind the decision was that:

The Canadian cellular industry has extended coverage to more than 94 percent of the population and most major highways, and the migration to digital systems is well advanced. The wireless industry has matured and experienced tremendous growth in subscribers, and consumers are being provided with a range of voice and data services. After nine years, the Canadian wireless industry is well established.⁵¹

66. Again, the extent of competition in the Canadian wireless sector does not require government to intervene and attempt to make the market "more" competitive. Given the risk of market inefficiencies and the difficulty in determining the appropriate cap, Industry Canada should not impose spectrum aggregation limits.

3.3 MANDATED ROAMING⁵²

67. The concern behind mandated roaming is that new entrants will be at a competitive disadvantage relative to incumbents if their customers have no ability to roam onto other networks. However, to this point, the industry solution to roaming appears to have worked well. Allowing carriers with better information about the market to negotiate private roaming arrangements would achieve an efficient outcome. If Industry Canada regulates roaming service, it needs to determine appropriate access fees, which from previous telecommunications experience is extremely difficult to do. Furthermore, mandatory roaming creates a free-riding problem and discourages investment and innovation which is not good for the industry or consumers.

68. While not discounting the fact that existing firms can enter into commercial agreements on their own, in the event of an anti-competitive refusal to deal, entrants have access to remedies under the *Competition Act* and do not require inflexible *ex*

⁵⁰ Gazette Notice No. DGTP-010-04.

⁵¹ *Ibid.*, paragraph 9.

⁵² While Industry Canada only requested comments regarding mandated roaming, it is important to note that the arguments presented in this sub-section, apply equally to both mandated roaming and tower sharing. Both require the use of facilities by rivals.

ante solutions. The *Abuse of Dominance Guidelines* state, "although not specifically listed in section 78, refusing to allow a competitor access to an incumbent's facility, or imposing restrictive terms of access, can constitute an anti-competitive act."⁵³

69. Even though the Competition Tribunal is not a price regulator, it can still mandate access and determine what constitutes compliance with the order:

In some cases, the Tribunal has explicitly ordered access to certain facilities or services. However, access will not improve competitive performance in a market if it is provided at a prohibitive price. The Tribunal has stated that it does not function as a price regulator, such as through ongoing oversight of rates or access price setting. The Bureau also does not have the legislative mandate to act as a binding price regulator in access disputes. Having said that, the level of the access price would usually be an important consideration in assessing whether a firm is in compliance with the order to provide access.

Subsection 79(2) gives the Tribunal broad discretion in making orders, and in limited circumstances this has included orders specifying formulas for setting prices. However, such orders do not involve ongoing oversight and instead specify what would constitute compliance with the order. Specific disputes over what would constitute "reasonable" access prices could be resolved through third-party mediation or arbitration.⁵⁴

70. The benefit of relying on *ex post* evaluation of competition concerns under the *Competition Act* is that the *Competition Act* is able to respond to competition concerns when and where they occur. The *ex post* evaluation does not dampen the competitive process and only intervenes once it has been demonstrated that the market has failed. This is particularly important when what constitutes an anti-competitive denial of access depends on the market conditions in both the downstream retail market and the upstream wholesale market.⁵⁵

71. Industry Canada should not mandate roaming, but rather continue to rely on market forces and allow the *Competition Act* to protect the competitive process as it does throughout the rest of the Canadian economy.

⁵³ Commissioner of Competition, *Enforcement Guidelines on the Abuse of Dominance Provisions*, (2001) at page 22. Available electronically at <http://www.competitionbureau.gc.ca/internet/index.cfm?itemID1251&lg=e>.

⁵⁴ Competition Bureau Canada, *Draft Information Bulletin on the Abuse of Dominance Provisions as Applied to the Telecommunications Industry*, page 24.

⁵⁵ *Ibid.*, pages 17-19.

4. CONCLUSION

72. Efficiently allocating resources at an initial stage reduces unnecessary transaction costs and revenue loss. The auction process is a highly efficient, market-based approach for spectrum management. The benefits of an auction for assigning spectrum licenses are that it tends to assign spectrum to those best able to use it, it creates competition for the spectrum which creates auction revenues, and it is transparent such that all parties can see who won and why.

73. Government intervention is a blunt instrument and hence difficult to keep narrowly focused. Industry Canada correctly recognizes that government intervention through the implementation of entry-assisting policies must be done with caution due to the efficiency costs that can be introduced into a competitive market. The implementation of a set-aside policy can create a number of inefficiencies, such as: (i) by reducing competition in the auction, the potential allocation of licences to inefficient firms; (ii) by reducing the information available as a result of having separate auctions, a greater chance of firms overbidding and going bankrupt; (iii) the reduction in information potentially reducing the amount of revenue generated; (iv) a costly need to correct flawed policy and reduced consumer welfare; and (v) to the extent to which capacity is reduced, so to are the benefits of economies of scale and scope. These inefficiencies arise because the set-aside policy divides the number of competing firms into two groups and auctions off the two groups of licences separately. This limits competition in both auctions and thus, the full benefits of using an auction process to allocate spectrum licences are not realized. It should be noted that all of these inefficiencies can also be introduced by spectrum aggregation limits.

74. With respect to mandated roaming, the industry solution to roaming appears to have worked well. Allowing carriers with better information about the market to negotiate private roaming arrangements achieves a more efficient outcome. The regulation of roaming service requires the determination of appropriate access fees, which from previous telecommunications experience is extremely difficult to do. Furthermore, mandatory roaming creates a free-riding problem and discourages investment and innovation which is not good for the industry or consumers.

75. The CRTC has already decided that economic regulation is no longer required, and the Competition Bureau's analysis of the market is consistent with the determination of the CRTC. This indicates that given the current state of competition in the Canadian wireless sector, there is no need for the government to intervene to make the market "more" competitive. To the extent that there remain any concerns about future firm behaviour, these can be addressed under the *Competition Act* and the *Telecommunications Act*, and there is no need for additional government oversight.

76. The appropriate policy framework is not one of industrial engineering, but rather the sound application of competition policy. The Canadian wireless sector does not need government intervention to increase competition and any concerns about future firm behaviour can be addressed by existing legislation. These two elements combined imply that the potential benefits of assisting entry are small. Thus, Industry Canada must carefully examine whether the benefits of assisting entry are significantly greater than the efficiency costs of constraining the auction process and imposing *ex ante* regulation.

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1. "Ratifiability of Efficient Collusive Mechanisms in Second-Price Auctions with Participation Costs," *Games and Economic Behavior* (forthcoming 2006) (with O. Yilankaya).
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3. "Equilibria in Second-price Auctions with Participation Costs," *Journal of Economic Theory* 130 (September 2006), 205-219 (with O. Yilankaya).
4. "Research Methodology and Recent Development in Industrial Organization," in *Distinguished Lecture Series*, edited by G. Tan, Shanghai University of Finance & Economics Press, 2006.
5. "The Market for Sweepstakes," *Review of Economic Studies* 72 (2005), 1009-1027 (with S.H. Chew).
6. "External Threat and Collective Action," *Economic Inquiry* 43 (July 2005), 519-530 (with E. Niou).
7. "Foreign Direct Investment and International Trade in a Continuum Ricardian Model," *Journal of Development Economics* 77 (2) (August 2005), 477-501 (with L. Cheng and L. Qiu).
8. "The Affiliation Effect in First-Price Auctions," *Econometrica* 73(1) (January 2005), 263-277 (with J. Pinkse).
9. "The Economic Theory of Vertical Restraints," *Review of Industrial Economics* 3(2) (2004), 1-23.
10. "Strategic Incentives of Divestitures of Competing Conglomerates," *International Journal of Industrial Organization* 21(5) (May 2003), 673-697 (with L. Yuan).

11. "Auction Theory," in *Research Frontier in Economics and Finance*, edited by G. Tian, 267-330, Commercial Affair Press, Beijing, 2002.
12. "Foreign Direct Investment and International Fragmentation of Production." In *Fragmentation: New Production Patterns in the World Economy*, edited by Sven Arndt and Henryk Kierzkowski, Oxford University Press, 2000 (with L. Cheng and L. Qiu).
13. "Equilibria in Networks," *Econometrica* 67(6) (November 1999), 1407-1434 (with K. Hendricks and M. Piccione).
14. "Accountability, Viability, and Soft Budget Constraint," *American Economic Review, Papers and Proceedings* 89(2) (May 1999), 426-431 (with J. Lin).
15. "Entry and Exit in Hub-Spoke Networks," *RAND Journal of Economics* 28(2) (Summer 1997), 291-303 (with K. Hendricks and M. Piccione).
16. "Cost-Reducing Investment, Optimal Procurement and Implementation by Auctions," *International Economic Review* 37(3) (August 1996), 663-685 (with M. Piccione).
17. "A Simple Model of Expert and Non-Expert Bidding in First-Price Auctions," *Journal of Economic Theory* 70 (1996), 501-515 (with M. Piccione).
18. "Optimal Procurement Mechanisms for an Informed Buyer," *Canadian Journal of Economics* XXIX (3) (August 1996), 699-716.
19. "An Arbitration Game and the Egalitarian Solution," *Social Choice and Welfare* 12(1) (1995), 29-41 (with W. Bossert).
20. "The Economics of Hubs: The Case of Monopoly," *Review of Economic Studies* 62 (January 1995), 83-99 (with K. Hendricks and M. Piccione). This article has been independently translated and published in a Japanese journal *Expressways and Automobiles* 38 (1995), No. 10 (page 59-64) and No. 11 (page 62-70).
21. "An Analysis of Dr. Sun Yat-Sen's Self-Assessment Scheme for Land Taxation," *Public Choice* 78 (1994), 103-114 (with E. Niou).
22. "Optimal Selling Strategies for Oil and Gas Leases with an Informed Buyer," *American Economic Review, Papers and Proceedings* 83(2) (May 1993), 234-239 (with K. Hendricks and R. Porter).
23. "Entry and R&D Costs in Procurement Contracting," *Journal of Economic Theory* 68 (October 1992), 41-60.
24. "Taiwanese Investment in Mainland China as a Policy Tool," *Issues & Studies* 28 (August 1992), 14-31 (with E. Niou and P. Ordeshook).
25. "Infanticide and Family Planning in Late Imperial China: The Price and Population History of Rural Liaoning, 1774-1873," in *Chinese History in*

Economic Perspective, Eds, L. M. Li and T. G. Rawski, Berkeley: University of California Press, 1992, 145-176 (with C. Campbell and J. Lee).

26. "Price and Population History in Rural Fengtien, 1772-1873," in *the Second Conference on Modern Chinese Economic History*, 511-542, January 5-7, 1989 (with C. Campbell and J. Lee).
27. "The Changes of Grain Prices and Population in Daoyi Village in Mid-Qing China," Volume 16, Number 3 (1988), 30-6 (with C. Campbell, A. Chu, and J. Lee).
28. "A Criterion for the Stability of a Class of Difference Equations," *Journal of Numerical Mathematics* (September 1984): 206-11.
29. "On the Sraffa System," *Journal of Quantitative and Technical Economics* (May 1984): 43-8 (with M. Song).

WORKING PAPERS

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31. "Platform Competition: The Role of Multi-homing and Complementors," with J. Carrillo, October 2006.
32. "Competition, Settlement Rates and Proportional Return Rule in International Telephone Markets," with H. Ju, 2006.
33. "Hidden Reserve Prices with Risk Averse Buyers," with H. Li, May 2000.
34. "Endogenous Coalition Formation in Rivalry," with R. Wang, HK University of Science and Technology Working Paper No. 97-7. Presented at the Public Economic Theory Meeting in Alabama, at the North American Summer Meeting of the Econometric Society in Montreal, June 25-28, 1998, and in the workshop on "Groups, Networks and Coalitions" in Barcelona, May 14-15, 1999.
35. "Competition and Regulation in Communications Industry." With D. Lu, 2001.
36. "Corporate Focus, Divestitures and Divisional Cross-subsidization," with S. Dasgupta and V. Goyal. Presented at the Hong Kong University of Science and Technology, 1999.
37. "Risky Investments and Optimal Credit Contracts," with W. Schworm. August 2000. Presented at the 25th Canadian Economic Theory Meeting in Vancouver, June 2-4, 2000.
38. "Human Capital Investment and Growth in the Presence of Moral Hazard," with W. Schworm, UBC Discussion Paper No. 94-05.

39. "Dynamic Properties of Overlapping Generations Economies with Optimal Wage Contracts," with W. Schworm, October 1996.
40. "A Theory of Alliance Formation," with E. Niou, UBC Discussion Paper No. 95-22.
41. "An Optimal Social Security System for China," with H. Li and Z. Tao. Presented at the International Conference on Social Security in China, Beijing, June 23-24, 1998.
42. "The Economic Theory of Auctions and Competitive Bidding: A Survey," Presented at the Research Center for Competition and Regulation, the Academy of Social Sciences, Beijing, December 15-19, 1999.

OTHER ACTIVITIES

Referee for *Journal of Economic Theory*, *Review of Economic Studies*, *Econometrica*, *American Economic Review*, *RAND Journal of Economics*, *Journal of Political Economy*, *International Economic Review*, *Economic Theory*, *Journal of Economics and Strategic Management*, *International Journal of Industrial Organization*, *Journal of Industrial Economics*, *European Economic Review*, *Canadian Journal of Economics*, *Journal of Law, Economics, and Organization*, *Economic Inquiry*, *Journal of Comparative Economics*, *Southern Economic Journal*, *Review of Economic Design*, *Scandinavian Journal of Economics*, *SSHRCC*, *NSF*.

Member of the Advisory/Executive Committee of the USC Institute for Economic Policy Research, 2004 – Present.

Member of the Advisory Committee of the USC's US-China Institute, 2005 – Present.

Organizer, the 18th *Canadian Economic Theory Conference*, Vancouver, May 28-31, 1993, sponsored by Social Sciences and Humanities Research Council of Canada, and the 25th *Canadian Economic Theory Conference*, Vancouver, June 2-4, 2000.

Organizer of the Beijing Summer Workshop on *Industrial Organization and Management Strategy*, Guanghua School of Management, Beijing University, June 14-15, 2004, School of Economics and Management, Tsinghua University, June 8-9, 2005, and Guanghua School of Management, Beijing University, July 8-9, 2006.

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EDUCATION

2002 Ph.D. in Economics, University of Calgary
 Dissertation Title: *Internalizing Network Externalities*
 Advisor: *Professor Jeffrey Church*

PROFESSIONAL EXPERIENCE

| | |
|----------------|---|
| 2006 – Present | Director – Economic Analysis Bell Canada |
| 2004 – 2006 | Senior Economist Competition Bureau Canada |
| 2002 – 2004 | Assistant Professor University of Lethbridge |
| 2000 – 2003 | Economist Competition Bureau Canada |

RESEARCH AFFILIATIONS

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| 2006 – Present | Research Fellow Institute of Advanced Policy Research University of Calgary |
| 2006 – Present | Associate Phelps Centre for the Study of Government and Business Sauder School of Business University of British Columbia |

AWARDS

Nominated for the Governor General's Gold Medal for Best Dissertation at the University of Calgary. November 2002.

Professor Z.M. Kubinski Prize in Economics. Winter 1994.

REFEREED JOURNAL ARTICLES

1. Serletis, A., and D. Krause, (1996), "Empirical Evidence of the Long-Run Neutrality Hypothesis Using Low-Frequency International Data," *Economics Letters*, 50: 323-27.
2. Serletis, A., and D. Krause, (1996), "Nominal Stylized Facts of U.S. Business Cycles," *Federal Reserve Bank of St. Louis Review*, 78: 49-54.

WORK IN PROGRESS

1. Church, J.R., N. Gandal, and D. Krause, (2003), "Indirect Network Effects and Adoption Externalities," Foerder Institute for Economic Research Working Paper 02-30.
2. Eaton, B.C., and D. Krause, (2005), "Coordination Cascades: Sequential Choice in the Presence of a Network Externality."
3. Coe, P.J., and D. Krause, (2005), "An Analysis of Price-based Tests of Antitrust Market Delineation." In submission.

CONFERENCE PROCEEDINGS

1. Hunter, L.A.W., P-L. Hébert, and D. Krause, (2006), "The *Competition Act*: 20 Years of Taking the Economy in Stride," on CD-ROM, *2006 Annual Conference on Competition Law*. Gatineau: Canadian Bar Association.
2. Monteiro, J., and D. Krause, (2005), "Air Transportation – *Are New Destinations on the Horizon?*" *Canadian Transportation Research Forum Proceedings of the 2005 Annual Conference*, p. 253-69.
3. Monteiro, J., and D. Krause, (2005), "Computer Reservation Systems in Canada – Changing Regulations and Their Economic Rationale," *Canadian Transportation Research Forum Proceedings of the 2005 Annual Conference*, p. 270-85.
4. Monteiro, J., G. Allen and D. Krause, (2004), "Canadian Transportation Alliances Under the *Competition Act*," *Canadian Transportation Research Forum Proceedings of the 2004 Annual Conference*, p. 31-46.
5. Monteiro, J., M. Nera and D. Krause, (2003), "The Canadian Air Cargo Business," *Canadian Transportation Research Forum Proceedings of the 2003 Annual Conference*, p. 642-58.
6. Monteiro, J, D. Krause, and A. Downs, (2002), "The Open Skies Agreement Between U.S. and Canada – Does it Suggest the Need for a Wider More Liberal Air Pact?" *Canadian Transportation Research Forum Proceedings of the 2002 Annual Conference*, p. 319-37.

7. Serletis, A., and D. Krause, (1996), "Money Aspects of North American Economies," *Economic Integration of the Americas*, C. Paraskevopoulos, R. Grinspun, and G. Eaton eds. Edward Elgar Publishing, p. 34-39.

PRESENTATIONS

1. Canadian Economic Association Annual Conference. Montreal. May 2006: "An Analysis of Price-based Tests of Antitrust Market Delineation."
2. International Industrial Organization Conference. Boston. April 2006: "An Analysis of Price-based Tests of Antitrust Market Delineation."
3. University of Lethbridge. October 2005: "An Analysis of Price-based Tests of Antitrust Market Delineation."
4. Alberta Conference on Industrial Organization, University of Calgary. October 2005: "Coordination Cascades: Sequential Choice in the Presence of a Network Externality."
5. Alberta Conference on Industrial Organization, University of Calgary. October 2005: "An Analysis of Price-based Tests of Antitrust Market Delineation." (Presented by Patrick Coe)
6. Canadian Economic Association Annual Conference. Hamilton. May 2005: "Mergers: A Year in Review."
7. Canadian Transportation Research Forum Annual Conference. Hamilton. May 2005: "Air Transportation – *Are New Destinations on the Horizon?*"
8. Canadian Transportation Research Forum Annual Conference. Calgary. May 2004: "Canadian Transportation Alliances Under the *Competition Act*."
9. Canadian Economic Association Annual Conference. Ottawa. May 2003: "Alberta Electricity Deregulation – A Review."
10. Canadian Transportation Research Forum Annual Conference. Ottawa. May 2003: "The Canadian Air Cargo Business."
11. Next Generation Colloquium. March 2003: "Institutional Issues in Transatlantic Aviation – A Comment."
12. University of British Columbia, Sauder School of Business, Division of Strategy and Business Economics. November 2002: "Indirect Network Effects are Externalities."
13. Vancouver Competition Policy Roundtable. November 2002: "Strategic Alliances and Section 45 Reform."
14. University of Lethbridge. May 2002: "Coordination Cascades: Sequential Choice in the Presence of a Network Externality."

15. Asia-Pacific Economic Cooperation. Seminar on Competition and Deregulation in the Electricity Sector. Mexico City, Mexico. May 2002: "Market Surveillance in Deregulated Electricity Markets."
16. Canadian Transportation Research Forum Annual Conference. St. John's, Newfoundland. May 2002: "The Open Skies Agreement Between the U.S. and Canada – Does it Suggest the Need for a Wider and More Liberal Air Pact?"

OTHER ACTIVITIES

Co – Editor *Canadian Competition Policy Page*, September 2003 – Present

Referee for: *Canadian Public Policy*, *Journal of Economics and Management Strategy*, *Journal of Transportation Economics*, and *Telecommunications Policy Journal*

Organizer of the *Conference on Economics in Competition Policy*, Ottawa, April 27-28, 2006, sponsored by the Competition Bureau Canada.

Referee for the 2004 and 2005 Annual Canadian Transportation Research Forum Paper Competition.

Referee for the 2003 Fall Semi-Annual Canadian Transportation Research Forum Student Paper Competition.

Invited participant at the STAR / STELLA Next Generation Colloquium 2003 sponsored by Transport Canada and the US National Science Foundation