



November 25, 2009

Written Ex Parte Presentation - via Electronic Filing

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

RE: *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers; Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless including Commercial Mobile Services, WT Docket Nos. 05-265, 09-66*

Dear Ms. Dortch:

T-Mobile USA, Inc. (“T-Mobile”) takes this opportunity to update the Commission on its positions on roaming issues. T-Mobile also submits the enclosed white paper, *Economic Analysis of the Provision Of Roaming Services in the Wireless Service Industry* (“*Economic Analysis of Roaming*”), prepared by Dr. Andrzej Skrzypacz, Professor of Economics at the Stanford University Graduate School of Business. In *Economic Analysis of Roaming*, Professor Skrzypacz analyzes the economic consequences of the Commission’s current roaming regime and discusses:

- The efficiencies and consumer benefits associated with roaming;¹
- The harms to American consumers and wireless industry participants from the “home market exclusion” to the Commission’s automatic roaming mandate;² and
- The need to adopt a general automatic roaming mandate that applies to mobile services (such as data services) not covered by the existing automatic roaming rule.³

The Commission’s roaming docket has been open since 2005, and the roaming marketplace has evolved since the Commission’s last significant action in this docket in 2007. In the

¹ See *Economic Analysis of Roaming* at 8-10.

² See *id.* at 10-11.

³ See *id.* at 11-12.

Roaming Order and Notice,⁴ the Commission adopted an automatic roaming requirement for voice, push-to-talk, and text messaging services, and also carved out “home markets” from that requirement. In late 2007, T-Mobile and several other carriers filed petitions for reconsideration urging the Commission to either abolish or substantially reform the home market exclusion.⁵ The Commission should grant those petitions, still pending after more than two years, and repeal the exclusion (at least to the extent it applies to areas in which requesting carrier has not constructed facilities and commenced selling service), without further delay.

In the *Roaming Order and Notice*, the Commission also requested comment on whether to adopt an automatic roaming rule with respect to mobile data services other than voice, push-to-talk, and text messaging services.⁶ T-Mobile supports a general automatic roaming rule for mobile services (both voice and data services) to give consumers access to broadband services when traveling as well as at home. This general roaming rule should require host providers of all mobile services to provide, on reasonable request, automatic roaming to technologically compatible mobile service providers, under reasonable and nondiscriminatory terms and conditions. Mobile service providers should be subject to the Commission’s complaint process to enforce this rule. We discuss each of these important points below.

Widely-Available Roaming Promotes Efficiency and Benefits Consumers. As noted in the National Broadband Plan workshops, roaming is a significant component of providing innovative services like mobile broadband.⁷ No mobile service provider has deployed facilities ubiquitously throughout its licensed service areas or has network facilities in all parts of the United States. Therefore most mobile service providers must rely on roaming

⁴ See *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers*, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 15817 (2007) (“*Roaming Order and Notice*”).

⁵ See Petition for Partial Reconsideration of T-Mobile, *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers*, WT Docket No. 05-265 (Oct. 1, 2007) (“T-Mobile Petition”). Petitions filed in WT Docket 05-265 cited hereinafter are short-cited. See also Leap Wireless Petition (Sept. 28, 2007); SpectrumCo Petition (Oct. 1, 2007); Sprint Nextel Petition (Oct. 1, 2007); MetroPCS Petition (Oct. 1, 2007).

⁶ See *Roaming Order and Notice* at 15845-47.

⁷ See National Broadband Plan Workshop: Wireless Broadband Deployment – General, Transcript, GN Docket 09-51, at 109-110 (Aug. 12, 2009) (“Aug. 12 Wireless Tr.”) (Exchange between Rob Curtis, FCC, and Neville Ray, T-Mobile). Transcripts of other workshops mentioned herein are available in GN Docket No. 09-51 and are short-cited by the date and topic of the workshop. Cf. August 13 Technology/Wireless Tr. at 107, 168 (Comments of Vanu Bose, Vanu, Inc.).

relationships with other mobile providers to allow their traveling customers access at affordable rates. As *Economic Analysis of Roaming* shows, roaming can improve the efficiency of the market and ultimately benefit consumers even when the requesting provider has a license to operate a network in a given area but has not built out that network throughout the entire license area.⁸

As consumers demand more mobile broadband applications, they of course will wish to access these applications anywhere in the country as they travel. Without reasonable roaming relationships among providers, both competition and innovation in mobile services will be stymied.

The Home Market Exclusion Should Be Repealed or Significantly Modified. As T-Mobile and others have demonstrated, the home market exclusion to the automatic roaming rule has harmed the marketplace and restricts the availability of reasonably-priced mobile services.⁹ Under the general terms of the current automatic roaming rule, a “host carrier”—the wireless provider on whose network another carrier’s customer roams—has the duty, on reasonable request, to provide automatic roaming to technologically compatible carriers on reasonable and nondiscriminatory terms and conditions.¹⁰ However, this obligation *does not apply* in the requesting carrier’s “home market,” which is defined as any area where it has a wireless license or spectrum-usage rights that could be used to provide CMRS services.¹¹

In *Economic Analysis of Roaming*, Professor Skrzypacz recommends elimination of the home market exclusion in light of significant changes in the wireless services market—specifically, the acquisition of a number of regional wireless providers by larger carriers—in the past few years.¹² Among other things, Professor Skrzypacz finds that repeal of this exclusion could help expand coverage to all wireless customers and increase transparency in the marketplace, reducing providers’ inducement to engage in anti-competitive conduct.¹³

⁸ See *Economic Analysis of Roaming* at 8-10.

⁹ In its reconsideration petition, T-Mobile proposed that the Commission modify the home market exclusion so that it applies only in areas in which the requesting carrier has an operating network in place that can be used to provide commercial mobile radio service (“CMRS”). See T-Mobile Petition at 1-2, 8-9; see also Reply of T-Mobile, WT Docket No. 05-265 (Nov. 16, 2007). Comments and reply comments in WT Docket 05-265 cited hereinafter are short-cited.

¹⁰ See 47 C.F.R § 20.12(d). The requesting carriers are known as “home carriers.”

¹¹ See *id.* §§ 20.3, 20.12(d).

¹² See *Economic Analysis of Roaming* at 10-11.

¹³ See *id.* at 11.

More generally, the home market exclusion creates a discriminatory market environment by shifting the legal presumption from regulatory parity to a legal and regulatory preference for discrimination based upon license status. The exclusion favors the two largest wireless carriers, AT&T and Verizon, by effectively insulating them from complaints under Section 208 of the Communications Act of 1934, as amended (the “Act”)¹⁴ about the roaming rates, terms, and conditions that they impose in many areas of the United States where they operate networks on which other providers rely for roaming.

The Commission should eliminate the home market exclusion, as numerous independent wireless providers have urged since the exclusion was created in 2007. Because no requesting carrier has fully deployed its network throughout the areas covered by its licenses or spectrum-usage rights, the home market exclusion severely limits the obligations of the nation’s two largest carriers to provide automatic roaming on a “reasonable and nondiscriminatory” basis. Eliminating the home market exclusion, or at least limiting it to areas in which the requesting carrier has not yet begun offering service on its own facilities,¹⁵ will make the Commission’s complaint process available as a forum to consider focused issues about individual roaming agreements without having to adopt broader intrusive regulations.

An Automatic Roaming Rule (Without a Home Market Exclusion) Should Apply to Mobile Services Generally: The Commission should adopt an automatic roaming rule to apply to mobile services, including data services like wireless broadband Internet access, to allow consumers access to the same broadband services (2G and 3G) while traveling as they have at home. Although, in 2007, T-Mobile stated that such a rule was premature,¹⁶ the time for a general roaming rule is now.

Accordingly, the Commission should require host providers of mobile services to provide, on reasonable request, automatic roaming to technologically compatible mobile providers, under reasonable and nondiscriminatory terms and conditions, subject to the Commission’s

¹⁴ 47 U.S.C. § 208.

¹⁵ In the commercial marketplace, a common practice is to limit roaming to areas in which the home carrier has not yet begun offering service on its own facilities. This practice provides the correct incentives to, and obligations and rights for, both host and home carriers. In particular, it ensures that host carriers will not be required to let other providers use their networks in areas (location area codes or “LACs” for GSM providers) in which the requesting carrier is actively selling service to the same prospective customers. This approach also allows the home carrier to benefit from its own investments by not being forced to roam in areas in which it has already constructed facilities.

¹⁶ See Reply Comments of T-Mobile (Nov. 28, 2007) at 1-5.

complaint process to enforce this rule. This “general roaming rule” would be an extension of the automatic roaming rule for voice.

T-Mobile’s experience since 2007 strongly suggests that, without the changes it seeks, roaming not covered by the existing automatic roaming rule will not be provided at reasonable rates, terms, and conditions, or may be withheld altogether, diminishing competition at the retail level and harming consumers. Because roaming arrangements between competing wireless providers are competitively sensitive, unreasonable roaming arrangements between providers can harm competition and consumers. As Professor Skrzypacz notes, data traffic is expected soon to become the most important part of mobile communications, and therefore, it is important to establish an automatic roaming policy now, to increase regulatory certainty so that firms can make more informed investment decisions.¹⁷

Consumers increasingly expect that when they are traveling, all services provided via their mobile units, including voice, e-mails, and mobile applications, operate seamlessly. As a result, competition in the market will inevitably be negatively impacted by the denial of roaming rights on any of these services. Thus, roaming for all such services, whether telecommunications services or information services, should be available on reasonable terms and conditions.

* * *

Roaming issues are long overdue for attention, and we urge the Commission to move swiftly to repeal or revise the home market exclusion and adopt a general roaming rule, as described above.

¹⁷ See *Economic Analysis of Roaming* at 12.

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Pursuant to Section 1.1206(b) of the Commission's rules, an electronic copy of this letter is being filed with the office of the Secretary. If you have any questions regarding this filing, please contact the undersigned.

Very truly yours,

/s/ Kathleen O'Brien Ham
Kathleen O'Brien Ham
Vice President, Federal Regulatory Affairs

Enclosure

cc: Ruth Milkman
Bruce Gottlieb
John Giusti
Angela Giancarlo
Renée Crittendon
Charles Mathias
Blair Levin

dc-581158

Economic Analysis of the Provision of Roaming Services in the Wireless Service Industry

White Paper

WT Docket Nos. 05-265, 09-66

Andrzej Skrzypacz, Ph.D.¹

November 2009

I. Introduction

A. Qualifications

I am a Professor of Economics at the Stanford University Graduate School of Business ("GSB"). I received my Ph.D. and my M.A. in economics from the University of Rochester and my B.S. and M.A. in economics from the Warsaw School of Economics. My specialties include industrial organization, game theory/strategy and auctions and market design. I am an associate editor at the American Economic Review, the Rand Journal of Economics and Theoretical Economics journal. I teach microeconomics for managers in the GSB Master of Business Administration program and a class on auctions, bargaining and pricing in the PhD program. I have done research in economics and finance and co-authored academic papers related to the dynamic investment choices and firm strategies. I have also co-authored articles on the telecommunications industry. My curriculum vita is attached as Exhibit 1.

I have studied the wireless service industry in my prior consulting engagements with firms in that industry. I have also read the FCC record regarding roaming and special access and discussed with T-Mobile the current developments in these sub-markets.

B. Summary

In this document, I present an economic analysis of how the markets for roaming services and other inputs interact with the downstream market for wireless services. I explain how competition for consumers in the downstream market can reduce a wireless firm's incentives to offer other firms access

¹ This paper was funded by T-Mobile USA, Inc.

to important inputs. For example, if a firm A is in direct competition for consumers with firm B, it realizes that selling access to its network (roaming services) will earn it additional roaming revenue and also can hurt it in the downstream market by making firm B a stronger competitor (to the benefit of consumers and with a reduction in firm A profits). The incentive to inhibit competitors by denying them access to an input increases as firms A and B become more direct competitors in the downstream market - for example, as a result of geographical consolidation. If the sum of firm profits goes down as a result of firm B having access to the input, the firms could not find a mutually beneficial input agreement.

In my opinion, the wireless services market has changed since 2005 in ways that can affect roaming access (and sharing other inputs). In particular, changes in ownership led to a disappearance of several important regional service providers (for example, Alltel, Dobson, Edge and RCC, a trend that started even before 2005). As a result, two firms with the largest physical networks can now offer roaming most efficiently in low-density/low-usage areas and elsewhere. These two firms are currently highly likely to compete directly in the downstream market with any other service provider that seeks access to roaming.² The acquisitions of regional service providers likely created cost savings. However, it is likely that it also changed the incentives to share inputs with other providers and has or soon will have negative consequences on the upstream markets (some of the changes in the downstream market may have not affected the upstream market yet, since many roaming and other input contracts are signed for multiple years). Such deterioration in the inputs markets would hurt customers by reducing the range of options they have and reducing competition in the consumer market.

Therefore in my opinion, measured action by the FCC is advisable: I think it would be beneficial for the consumers if FCC took the position that it expects firms to offer roaming services in voice services on reasonable terms where it is efficient to do so. A good avenue for assuring such outcome is to remove the so-called in-market exception in the current automatic roaming rule. That would allow the FCC to get information if firms try to reduce the coverage of their competitors (to the detriment of their consumers) by denying them access to roaming at fair and reasonable rates. Hopefully, such a position would be sufficient to assure efficient sharing but in the event of complaints, I suggest the FCC to consider them on a case-by-case basis. If the volume of complaints turns out to be large, then further policy may need to be established, based on the new evidence generated from the complaints and following enquiry. In my opinion it is too early for any policy changes for voice services beyond the removal of the in-market exception since there are no alarming signals from the downstream market and the FCC currently has no good data on the competitive conduct in the upstream market for roaming services.

² Consumers value and expect wide coverage, even in areas of low-frequency of use. Moreover, as I explain below, roaming is especially efficient in these areas - it is especially inefficient to duplicate the build-out and maintenance cost in areas with a small volume of calls and even more so using high-frequency bands.

Finally, the growing importance of mobile data services makes it advisable for the FCC to take action regarding roaming on data networks. Such policy may be especially important in the current market conditions because, unlike at the beginning of voice networks, the main data networks are operated not by regional but by nation-wide operators. That reduces chances that they would find it mutually beneficial to share access with other service providers and that can reduce competition in the downstream market to the detriment of consumers.

II. Competition in the wireless industry in the consumer market depends on the strategies employed in the inputs markets.

Firms in the wireless service industry offer consumers voice and data services and compete in multiple dimensions. Consumers choose plans and providers based on multiple criteria. The main of them are:

- price/quantity characteristics of offered packages³,
- coverage (both voice and data coverage),
- quality (for example, frequency of dropped calls, speed of network), and
- the range and features of handsets (and other equipment) offered or compatible with the provider's service

In order to offer valuable service to consumers, a service provider relies on a number of crucial inputs, some of which are physically in short supply and some of which can be acquired from a very limited set of suppliers (with high barriers to entry for competing suppliers or developing alternatives in-house). The ability to provide high quality service to consumers (with wide, robust coverage, high speed etc) depends crucially on these inputs.

First of all, there is a limited amount of spectrum licenses and not all spectrum licenses are equally useful in developing a robust coverage. For example, among frequencies usually licensed by the FCC to commercial providers, the lower the frequency range of a license, the cheaper it is to provide coverage, especially in rural areas where it may not be economically feasible for wireless providers to construct a dense network of cell sites.⁴

³For example, in the case of a post-paid package, a customer considers the price of the package, the number of included voice minutes, megabytes of data and text messages, prices for over-the-included limit minutes, data, text messages, as well as other aspects of the plan (for example so-called “roll-over” minutes).

⁴ Similarly, lower frequency signals are better at penetrating walls and hence lower frequency licenses can be better at providing coverage in buildings

Second, service providers must obtain a variety of inputs, including roaming services in areas where they do not have their own network coverage, backhaul services (to bring traffic from antennas at cell sites to the main network) and location or co-location of antennas at cell sites.

III. Changes in downstream market competition affect incentives to sell inputs to other service providers.

In every consumer market quality, prices and availability of products depend on the competitive conditions in the inputs market. In my opinion, what is special about the wireless services market is that for many service providers a very large proportion of crucial inputs has to be purchased from firms that are in direct competition with them in the consumer market. As I illustrate in this section, this creates adverse anti-competitive incentives in the inputs market that can ultimately hurt consumers by reducing the variety and quality available from competing service providers. The resulting reduction in competition can also lead to higher prices.

Changes in ownership, and in particular acquisitions of regional network operators, are likely to create efficiency gains. At the same time, they can have negative effects on the efficiency of upstream markets. To illustrate this point, I discuss how geographical consolidation of wireless service, by increasing the area over which an input supplier is in direct competition for consumers with other providers, reduces that supplier's incentives to sell the inputs. That can make it impossible to find a mutually beneficial agreement to offer these inputs (even when they were possible before geographical consolidation and even if offering these inputs would be still efficient and beneficial to customers).

I present a stylized model the effects of geographical consolidation. The model is on purpose simplistic to highlight a particular anti-competitive effect of consolidation in the inputs market, an effect that is going to be present in any more realistic model.

Suppose that the national market consists of two geographical areas: Urban area and a Rural area with consumers in those areas buying services from local firms yet valuing service in both areas.

Scenario 1: 3 Independent providers

Suppose there are first 3 firms providing services in this market: firms A and B in the Urban market and firm C in the Rural market. Suppose that if none of them offers roaming services, each firm would earn a profit of 100.

Assume that out-of-area roaming is valued by customers and a firm offering roaming can partially extract that increase in consumer surplus and hence increase its profits.

Suppose that if firm C offers its customers roaming services (when they are in the Urban market), its profits will increase to 104. Moreover, assume that firm C is not in direct competition with firms A or B. That is, firm C profits from selling service to customers who do not depend on firm A and B offerings and vice versa (but firms A and B do compete).⁵

Consider the following two roaming outcomes:

a) Only one of the firms in the Urban area is able to provide roaming in the Rural area to their customers, say firm A. Assume that in that case profits of firm A increase to 104 while the profits of firm B drop to 99. The rationale is that firm B is hurt by having inferior coverage and firm A benefits both from providing additional value to customers and from having a better product than competition (the business stealing effect).

b) Both firms in the Urban area offer roaming in the Rural area. In that case assume that the profits of both firms are 101. They both benefit from offering a more-valued-service to their customers, but compared to the previous case, the total industry profits are lower since they compete more closely in coverage.⁶

What is a likely market outcome in terms of the roaming for customers of firms A and B in the C territory? I argue that if firm C is not allowed to sign exclusive roaming contracts (e.g., if such contracts are prohibited by an automatic roaming rule) then both firms A and B are likely to negotiate with firm C a contract that would allow them to offer roaming in the Rural area to their customers.

The reasoning is as follows: suppose neither A nor B offer roaming: then firm A can sign a contract with firm C at terms that split the increase of firm A profits from 100 to 104, hence such an outcome would be unstable (if firm A anticipates firm B to obtain roaming agreement as well, the terms would split a profit increase to 101 only). Suppose only firm A has a roaming agreement with firm C. Then firm B could approach firm C and find a mutually beneficial

⁵ Finally, assume that offering roaming does not involve any physical costs. This assumption is only for simplicity of the exposition: if providing an input is costly, then changes in profits in this model should be interpreted as *net* of these costs. For example, if firm C obtaining some input from firm A (roaming, backhaul, equipment etc) increases its profits from 100 to 110 but it costs firm A incrementally 6 to provide that input to firm C, we would say that the *net* profit goes from 100 to 104.

⁶ Of course, the particular numbers in this simple model do not matter – what matters is only that a firm offering roaming increases its profit, takes some business from its local competitors (i.e. reduces competitors' profits) and if only a subset of the firms offers a particular feature (say, nationwide coverage), total industry profits can be higher since it allows that subset of firms exercise market power over that feature.

contract that would split the increase in firm B profits from 99 to 101. Only one firm offering roaming would be unstable too.⁷

Firms A and B offering coverage in both areas is going to benefit customers in the Urban area: they are going to have more choice in choosing a provider even if they care a lot about coverage and the competition between firms A and B is likely to keep the price for the additional coverage low.

Scenario 2: Firms A and C merge

Now suppose firms A and C merge (without changing any of their cost structures) and form a new firm A&C. As long as the old roaming contracts are valid, such a geographical consolidation should have little impact on the competition for the consumers: as long as firm B has access to the same roaming agreement as before the merger, there is no change in any of the markets in local competition and hence little reason for firms to change their price or product strategies. However, when the roaming contract expires, the incentives to renew it change dramatically: after the merger there is no mutually beneficial contract that firms B and A&C can sign to offer roaming in the Rural area to firm B customers!

The reason is that if the A&C firm does not offer roaming, its profits in the Urban market will be 104. If it offers roaming, profits would drop by 3 to 101. So 3 is the smallest price firm A&C would accept for the input. Yet, firm B gains only 2 from having access to roaming (profits go from 99 to 101), and hence is not willing to pay that much.

What is the result for customers? Note that the merger did not change at all whether it is efficient (in terms of total surplus) to offer roaming or whether customers would benefit from it. Yet, the change in the consumer market structure changed incentives to offer roaming and made it impossible to find a mutually beneficial agreement and hence the customers are likely worse off: they will have fewer choices and the lack of competition will give firm A the market power to charge more than it could in Scenario 1 and keep the same demand.

There are a few general observations we can draw from this simple model

⁷ If firm C could sign an exclusive contract (or in this case equivalent contracts that would specify terms of the roaming agreement between firm C and firm A *conditional on* whether firm C offers roaming to firm B) then the outcome could be different since firm A has incentives to offer firm C better price for exclusive roaming.

1) Although the model discusses incentives to sell roaming services, it is clear that it can be applied to any input sold by a competitor. The main force in the model is that when firm C sells firm B an input, it makes firm B more competitive and that reduces profits of firm B's competitors in the consumer market. If one of these competitors merges with firm C, it is less likely that there will be a mutually beneficial agreement that the firms can sign (despite no change in the efficiency of such an agreement or its benefits to customers).⁸

2) The disincentive to offer access to inputs increases in strength of the competition effect: firms A&C and B are less likely to find a mutually beneficial agreement in the inputs market the more the increase of firm B profits (due to access to the input) comes at the expense of firm A&C profits (due to the increase in competition). For example, such input agreements are less likely the larger is the overlap in the areas in which firms B and A&C compete for customers. On the other hand, if firms A&C and B have small market shares in the customer market, then gains in firm B profits are likely to come at the expense of profits of *other firms* and hence it is more likely that a mutually beneficial input contract can be found.

3) The input markets are negatively affected if there is a reduction in the number of input providers. For example, consider the following variation of the model: suppose that we start with firms D and E in both markets and firm F in the Urban market only. Even if firm D is reluctant to offer roaming services in the Rural market to firm F, it may do so facing the competitive pressure from firm E. For example, suppose that if firm F does not have access to roaming, the profits of the 3 firms in the Urban market are 104, 104 and 99, and if it has access to roaming (from any of the firms) the profits are 101, 101 and 101. Then it is possible that firm F will sign a roaming agreement with *both* of the firms because if firm D expects firm E to offer firm F roaming, it knows firm F will have access to roaming and hence there is no competitive benefit to deny firm F access. In contrast, should firm D exit the market (or should firms D and E merge), then firm D, not feeling competitive pressure, would have no reason to sell firm F the input (according to the numbers, firm D would offer the input for a price no lower than 3 since that is the decrease in profits it is facing in the consumer market - but firm F would benefit only 2, so it would find that price too high).

An important assumption in the model is that efficiency in the market is improved if firms obtain access to certain of the inputs of their competitors, for example, roaming access. In the case of roaming, I am basing this assumption on the observation that many customers value (and often expect) ubiquitous

⁸ As we noted above, exclusive contracts have analogous negative effects on competition: even if firm A does not merge with firm C, they have incentives to sign an exclusive contract, preventing firm B access to the input. That is relevant, for example, in case of contracts for locating antennas or contracts with equipment providers.

service and that coverage is an important dimension for consumer choice. The indirect evidence is that that service providers with better coverage have higher prices and higher market shares.⁹ Moreover, much advertising by service providers emphasizes coverage (in terms of the coverage maps or the signal strength or speed of network).

IV. Roaming can be efficient for investment even where firms have spectrum rights but have not yet built out their networks.

The model we discussed points out that the competition in the consumer market depends on the competition in the inputs markets and especially on the number of available input providers and to what extent they are in direct competition in the consumer market with the firm looking to purchase the input.

In case of roaming, the first policy issue is then to put more licenses into the wireless services use so that there are more options either among suppliers of the input or for firms to “self provision” by obtaining greater geographic coverage.

The second policy issue is then whether firms should be encouraged to offer roaming to a third party *even if* the third party has a license to operate a network in a given area but did not build out that network with as wide coverage. In my opinion, in many such cases roaming is going to still improve efficiency of the market outcomes and ultimately benefit consumers. The reason is that if firm A has a network that is operating below capacity and could handle traffic from customers of firm B without reaching capacity, roaming avoids duplication of build-out and maintenance costs. That is especially important in low-density areas where a single cell site has enough capacity to handle some all traffic in that area (it is less important in high-density areas where traffic is high enough that additional cell sites are built for capacity rather than for coverage). The duplication of costs in low-density areas is made even more acute because of shortage of desirable spectrum. For example, if firm A has a license in the lower-frequency spectrum (say in the 800MHz or 700MHz bands) while firm B has a license in the high frequency spectrum (say the 1.9 GHz band), then it is much cheaper for firm A to offer coverage in a low-density area. For the vast majority of the U.S. territory, lower-frequency spectrum bands have a clear cost advantage in providing coverage: a network built using lower frequencies requires many fewer cell sites for the same coverage using higher frequencies – there are major efficiency gains from

⁹ Admittedly, this is not completely conclusive evidence since the firms with better coverage may be preferred by customers on other dimensions.

roaming in these areas.¹⁰ Hence, in my opinion a policy encouraging roaming agreements *even in areas where both firms have licenses* can be beneficial to customers. The FCC should carefully take into account this analysis when considering whether to eliminate the so-called home market exception in its current automatic roaming rule.

In the record of the FCC's roaming proceeding in 2005-06 several comments pointed out that one cannot look at the GSM or CDMA standards separately, since companies using either of these technologies compete for the same consumers in the services market. When we discuss the efficiency of roaming agreements, however, it is important to consider the additional cost a firm and its consumers would have to suffer if it tried to offer service on both networks. In the 2005 record it appears that the firms expected new technological developments to make such dual-standard solutions to become economical in near future. Four years later it is clear that these expectations did not come true: there are very few devices that operate in both standards, so any consumer trying to use such a network would be severely constrained in the choice of hardware. Moreover, such handsets are larger, heavier, drain battery faster and cost more than single-standard ones. Hence, in my opinion the current reality is that roaming across networks with these two different standards is not yet economically viable - to my knowledge such cases are very rare in the world.¹¹

A careful roaming policy needs to trade-off these efficiency benefits of sharing networks with the impact forced roaming can have on the incentives to build-out networks. In particular, firms building out networks need to expect a high enough rate of return on their investment. Otherwise, they can delay such investments to the detriment of the customers.

V. There are fewer regional network operators. Yet, there are insufficient data to tell if the ownership changes are negatively affecting competition.

In the last eight years we have seen gradual yet important changes in the ownership structure in the wireless services markets. In particular, several important regional network operators have been

¹⁰ In high-density areas the differences between low- and high- frequency bands are smaller since to provide sufficient capacity firms cover the area with a much denser network of towers. The main exception is coverage inside buildings – the low-frequency bands propagate walls better and hence to provide in-building coverage the low frequency networks may have advantage even in high-density areas.

¹¹ That situation may change in 10 years if a single network standard largely replaces the two current network standards. However, even if the development of LTE networks starts soon and starts the road towards a single network standard, I expect that it will take a long time until the current GSM or CDMA voice networks are replaced in the low-density areas.

acquired by other firms: for example, AT&T Wireless in 2004 and Alltel, Dobson, Edge and RCC more recently. As a result, the firms that own a large share of these previously-independent networks are now more in direct competition in the consumer market (in some other geographical area) with providers looking to extend their coverage via roaming. As the model above illustrates, even if in any given geographical area the changes of ownership did not change the downstream competition, they can have indirect negative effects on competition in other areas, via the input markets.

If that happens, it is likely to hurt customers at first via a reduction in coverage if their provider can no longer negotiate roaming (or via the need to switch a provider to keep the coverage). If such reductions in coverage become a reality then in the longer run customers are also likely be hurt by higher markups they would pay for the access to the now-more-exclusive coverage. However, we have little or no data to determine the status of the situation. In particular, the data on roaming terms that were available during the 2005-2006 proceedings (from the CTIA surveys) were very imprecise and did not present a clear picture of the market.¹² It is possible that it is too early to witness the effects of the changes in the inputs market on the consumer market: roaming agreements are usually written for 3 years or more and many of the contracts that were current in during the 2006 proceeding (or at the time the regional operators were acquired), are still being used or are being re-negotiated.

VI. Suggested course of action is to repeal the in-market exception and to consider extending roaming requirements to data services.

Based on my analysis, the changes in the ownership structure changed the competitive environment sufficiently to create concern about the possible anti-competitive effects in the inputs market, in particular in the market for roaming services. Therefore I would recommend removal of the in-market exception in the current automatic roaming rule.

The repealing of the in-market exception would have two important effects. First, it would establish the expectation that firms should offer access to roaming on their networks to all other compatible providers, to expand coverage to all customers. Second, by creating a venue for firms to complain about the possibly anti-competitive conduct of other firms in the inputs market, it would provide better data on the state of competition in that inputs market. That second benefit may be important since it is my understanding that roaming contracts are often fairly complicated and roaming negotiations are sometimes tied with other negotiations, so that simply collecting data on contracts (or the lack of them) may be insufficient to determine changes in the competition in the input market.

¹² See for example a report by Gregory L. Rosston “An Economic Analysis of How Competition Has Reduced Roaming Charges” from 2005, where he describes the main problems of interpreting the survey data.

An additional benefit of repealing the in-market exception is that it will increase transparency of the market and hence reduce providers' temptation to engage in anti-competitive behavior. When roaming is efficient, a firm with larger physical network may agree on terms to offer roaming access to a direct competitor with a strictly smaller physical network even if it is not in the immediate interest of the firm (because it would make that competitor offerings more attractive to customers). The reason is that when roaming is efficient, firms may expect future action from the FCC if they do not agree on roaming terms and may prefer to settle without the regulator's involvement.

At the same time, I think it is premature for the FCC to take more intrusive regulatory actions. In particular, I do not think that regulating roaming rates is at this time advisable - the wireless services market for consumers is very competitive and consumers enjoy choice and competition among providers. The consolidation in recent years has not lead to bad outcomes for the consumers yet and before any anti-competitive behavior can be demonstrated, I see no reason for the FCC to regulate prices, which would be a very difficult task. For now I think it is important for the FCC to stress its position that firms should share inputs when it is efficient to do so.

A natural question is what should be the procedure in case a firm complains about a network provider not offering roaming at just and reasonable rates. As the existing record indicates, there is no obvious solution to this question and in my opinion we know too little about the roaming market to be able to design a good policy right now. Therefore, I would recommend that for now the FCC establish expectation that each such complaint would be considered individually and if the number of complaints grows, there may be need for further policy helped by the data provided by the complaints and any following enquires.

Finally, I think it would be beneficial to the future development of the wireless services market if regulators described policy plans pertaining to roaming on data networks. Data roaming has become a major component of roaming expenditure and consumers are moving more and more into using data services on their mobile devices.

The data-roaming policy has to carefully consider two factors. First, at least in the case of 3G networks, as far as I can tell, sharing access to 3G data networks is limited for reasons that are most likely fairly close to the ones in the model above: offering a third party access to own 3G network creates stronger competition in the consumer market and hence there may be no mutually beneficial contract that two service providers can sign. An efficient roaming agreement could benefit consumers, but if the increased competition from a roaming agreement reduces the *sum of firm profits* firms would not be able to agree to it. The situation is very different from the past when different firms were building voice networks in different geographical areas and could quickly expand their coverage by signing mutual roaming agreements with firms in other areas (like in the first scenario in our model). The current situation is such that 3G build-out is done mostly by firms with nation-wide sales and hence there are fewer such "mutual-roaming-exchanges" available. Second, the roaming policy for data traffic has to take into

account that we are still in the process of rapid growth in coverage and performance of data networks and one of the driving forces behind the investments in these networks is the expectation that firms will be able to earn profits from deploying these networks.

In my opinion it may be too early to tell the “optimal” policy regarding data roaming in the current market. Yet, since it is expected that data traffic will soon become the most important part of mobile communications (with even voice being possibly sent as data packets), it is important to establish an automatic roaming policy now, to increase regulatory certainty so that firms can make more informed investment and competitive decisions. In my opinion, unless firms can demonstrate major threats to the build-out of their data networks, it would be in the interest of customers to extend the automatic roaming policy from voice to data since in the case of voice services the automatic roaming rule has benefited customers and in the current market conditions a policy protecting competition in the inputs markets may be even more important than in the past.

Andrzej (Andy) Skrzypacz

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Stanford Graduate School of Business

518 Memorial Way

Stanford, CA 94305-5015

E-mail: andy@gsb.stanford.edu

WebPage: www.stanford.edu/~skrz

Phone: (650) 736-0987 **Fax:** (650) 725-9932

Education

Ph.D. Economics, University of Rochester, October 2000.

M.A. Economics, University of Rochester, May 2000.

M.A. (magisterium) Economics, Warsaw School of Economics, Warsaw, Poland, June 1997.

B.S. (licencjat) Economics, Warsaw School of Economics, Warsaw, Poland, June 1995.

Employment

Professor of Economics, Stanford Graduate School of Business, since 2009.

Associate Professor of Economics, Stanford Graduate School of Business, 2004-2009 (with tenure since 2007).

Assistant Professor of Economics, Stanford Graduate School of Business, 2000-2004.

Research

Published and Accepted Papers

Yuliy Sannikov and Andrzej Skrzypacz (2009) "The role of information in repeated games with frequent actions." Forthcoming in *Econometrica*.

William Fuchs and Andrzej Skrzypacz (2008) "Bargaining with Arrival of New Traders." Forthcoming in *American Economic Review*.

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Andrzej Skrzypacz and Hugo Hopenhayn (2004) “Tacit Collusion in Repeated Auctions.” *Journal of Economic Theory* 114 (1), pp. 153-169. (One of the 20 Most Cited articles 2004-2008 published in JET).

Working Papers and Work in Progress

Christopher Phelan and Andrzej Skrzypacz (2008) “Beliefs and Private Monitoring.”

Matthew Mitchell and Andrzej Skrzypacz (2008) “A Theory of Market Pioneers.”

Joseph E. Harrington, Jr. and Andrzej Skrzypacz (2008) “Collusion with Monitoring based on Self-Reported Sales.”

William Fuchs and Andrzej Skrzypacz (2008) “Bargaining with Deadlines.”

Simon Board and Andrzej Skrzypacz (2008) “Dynamic Auctions for Durable Goods.”

Qingmin Liu and Andrzej Skrzypacz (2009) “Limited Records and Reputation.”

Johannes Horner and Andrzej Skrzypacz (2009) “Selling Information.”

William Fuchs and Andrzej Skrzypacz (2008) “Bargaining with Interdependent Values and Generalized Coase Conjecture.”

Earlier working papers:

Ilan Kremer and Andrzej Skrzypacz (2006) “Information Aggregation and the Information Content of Order Statistics.”

Jerzy Konieczny and Andrzej Skrzypacz (2006) “Search, Costly Price Adjustment and the Frequency of Price Changes – Theory and Evidence.”

Matthew Mitchell and Andrzej Skrzypacz (2006) “Market Structure and the Direction of Technological Change.”

Ilan Kremer and Andrzej Skrzypacz (2004). “Auction Selection by an Informed Seller.”

Andrzej Skrzypacz (2004) “Bargaining under Asymmetric Information and the Hold-up Problem.”

Main Non-Refereed Articles

Paul Milgrom, Gregory Rosston, and Andrzej Skrzypacz “Using Procurement Auctions to Allocate Broadband Stimulus Grants.” SIEPR Policy Brief, May 2009.

“Comments of 71 Concerned Economists: Using Procurement Auctions to Allocate Broadband Stimulus Grants,” organized by Paul Milgrom, Gregory Rosston, Andrzej Skrzypacz, and Scott Wallsten, submitted to NTIA April 13 2009.

Gregory Rosston and Andrzej Skrzypacz “The FCC’s 700 MHz Auction.” SIEPR Policy Brief , December 2007

Peter Cramton, Andrzej Skrzypacz and Robert Wilson “The 700 MHz Spectrum Auction: An Opportunity to Protect Competition In a Consolidating Industry,” submitted to the U.S. Department of Justice, Antitrust Division, 13 November 2007.

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Peter Cramton, Andrzej Skrzypacz and Robert Wilson “Revenues in the 700 MHz Spectrum Auction” Working Paper, University of Maryland, 27 June 2007.

Main Professional Service

Associate Editor for the American Economic Review.

Associate Editor for the RAND Journal of Economics.

Associate Editor for Theoretical Economics.

PhD Students advised (original placement in brackets):

As Principal Co-Advisor: Yuliy Sannikov (Berkeley), William Fuchs (Chicago), Michael Grubb (MIT), Qingmin Liu (Penn) Peter Lorentzen (Berkeley), Brendan Daley (Duke), Kyna Fong (Stanford), Brett Green (Northwestern), Bumin Yenmez.

As Committee member: Simon Board (Toronto), Ayca Kaya (Iowa), Tomasz Sadzik (NYU), Yuval Salant (Northwestern), Philip Tzang (Hong Kong BCG), Juan Escobar (U. of Chile), Juuso Toikka.

Honors and Grants

NSF Grant # 0721090 for a research project with Christopher Phelan ““Beliefs and Private Monitoring.””

Joseph and Laurie Lacob Faculty Fellow for 2007-2008

Stanford GSB PhD Distinguished Service Award 2005

Best paper award, Utah Winter Finance Conference 2004, joint with Peter DeMarzo and Ilan Kremer for "Bidding with Securities: Auctions and Security Design"

NSF Grant # 0318476 for a research project with Peter DeMarzo and Ilan Kremer “Bidding with Securities - Auctions and Security Design.”

MBA Class of 1969 Faculty Scholar for 2002-2003