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ECONOMIC CONSULTING

In the matter of Telecom Notice of Consultation CRTC 2017-259
Call for comments – Reconsideration of Telecom Decision 2017-56 regarding final terms and conditions for wholesale mobile wireless roaming service

Prepared for
Shaw Communications Inc.

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An assessment of wholesale roaming policy in Canada

Response to initial interventions in Telecom Notice of Consultation CRTC 2017-259

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I. Scope of charge

(1) I have been asked by Shaw Communications Inc. ("Shaw") to respond to the initial interventions of interested parties in the first round of this proceeding, in particular to the initial interventions by the parties supporting mandated wholesale roaming access for Wi-Fi First or other resale-based models.

(2) This supplemental white paper considers the evidence presented in those initial interventions, especially as it relates to the arguments I made in my initial white paper. It is informed by economic theory, the available empirical evidence, and my training and experience as an economist focused on competition issues. My *curriculum vitae* is included as Appendix A.

II. Executive summary

(3) This paper addresses the comments made in the first round of submissions in this proceeding, particularly the initial interventions of the parties supporting mandated wholesale roaming access for Wi-Fi First or other resale-based models, in light of the arguments I made in my initial white paper.

(4) Several of the interventions argue that Canada's mobile wireless industry would benefit from more competition. I agree. In my initial white paper, I pointed to evidence that the three national incumbent carriers exercise significant market power.[1]

(5) I do not agree that providing mandated wholesale roaming access for resellers will achieve meaningfully increased competition. As I discussed in my initial white paper, economic theory and empirical evidence both point to the critical importance of increased facilities-based competition for pro-consumer outcomes in the mobile wireless sector, including in promoting the development of and access to resale-based models.[2] Mandated reseller roaming does not increase facilities-based competition, and instead may threaten it.[3]

(6) There is an important distinction between policies that promote facilities-based competition and investment and those that undermine such competition and investment. Under current roaming regulation in Canada, new entrants and regional carriers can offer national voice and data via mandated wholesale access to the national networks, as long as the access is incidental. As I explained in my initial white paper, this policy promotes investment and build-out by new entrants and regional carriers.[4] It thus helps remedy the underlying competition problem in wireless. Granting mandated roaming access to resellers, in contrast, tends to undermine investment incentives and the further development of facilities-based competition.

(7) The current regulatory approach is consistent with modern economic theory on the regulation of industries with inadequate competition. Regulation that promotes competition and thereby harnesses market forces rather than supersedes them is generally recognized as a better way of resolving problems caused by market power than more comprehensive government intervention.[5] This is particularly true in technologically advancing industries. A reseller roaming mandate would introduce a host of new definitional and pricing questions that would need to be frequently revisited as

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1 Eric Emch, "An Assessment of Wholesale Roaming Policy in Canada: The Interaction of Competition, Regulation, Access, and Investment," Sept. 8, 2017, report prepared for Shaw Communications Inc. in the proceeding initiated by Telecom Notice of Consultation CRTC 2017-259 ("TNC 2017-259") [hereinafter "Initial white paper"], ¶¶ 13, 24.

2 Initial white paper, ¶¶ 9–10, 86.

3 *Id.*, ¶¶ 31–32.

4 *Id.*

5 This principle was recognized in the *Telecommunications Act* (S.C. 1993, c. 38), which has as one of its objectives "to foster increased reliance on market forces for the provision of telecommunications services and to ensure that regulation, where required, is efficient and effective" (§ 7(f)).

technology advanced. Neither mandated reseller roaming nor retail regulatory intervention will resolve the underlying competition problem in wireless, and both will undercut the expansion of facilities-based carriers, particularly smaller carriers.

III. The Canadian wireless market would benefit from increased facilities-based competition

(8) Many initial interventions in this proceeding, including my initial white paper, argue that the three incumbent national wireless carriers in Canada have market power and that Canada's mobile wireless industry would therefore benefit from more facilities-based competition, in particular in regions that lack a strong alternative to the three incumbent national carriers.[6]

(9) For instance, the filing by the Public Interest Advocacy Centre (PIAC) cites a 2015 report by the Organisation for Economic Co-operation and Development (OECD) to support the notion that more facilities-based providers are needed to spur competition:

> In order to stimulate stronger competition, what are often needed (as affirmed by the OECD) are more facilities-based providers which can effectively capture market share from the incumbents.[7]

III.A. Evidence of the benefits of increased facilities-based competition

(10) That OECD report, "Wireless Market Structures and Network Sharing," looks at recent experiences in the wireless industries of selected OECD countries as a function of the number of facilities-based providers, as well as examining questions surrounding wireless network sharing.[8] Among its key findings:

- Countries with a larger number of facilities-based carriers have a higher likelihood of introducing and maintaining more competitive and innovative services.[9]
- A more competitive facilities-based environment provides incentive for both facilities-based carriers and resellers to improve their offers in terms of price, services offered, and quality.[10]

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[6] *See, e.g.*, Intervention of the Public Interest Advocacy Centre, Sept. 8, 2017, in the proceeding initiated by TNC 2017-259 [hereinafter "PIAC initial intervention"], ¶ 4; Cogeco initial comments, Sept. 8, 2017, in the proceeding initiated by TNC 2017-259, ¶¶ ES2–ES3; CNOC initial intervention, Sept. 8, 2017, in the proceeding initiated by TNC 2017-259 [hereinafter "CNOC initial intervention"], 2, 7–8; Intervention de Québecor Média inc. (Québecor Média) au nom de sa filiale Vidéotron s.e.n.c. (Vidéotron), Sept. 8, 2017, in the proceeding initiated by TNC 2017-259 [hereinafter "Videotron initial intervention"], ¶¶ ii, 20.

[7] PIAC initial intervention, ¶ 111.

[8] OECD, "Wireless Market Structures and Network Sharing" (OECD Digital Economy Papers, No. 243, 2015) [hereinafter "OECD report"], 7. The authors use a case study approach to examine the consequences of increasing or decreasing the number of facilities-based competitors in OECD countries.

[9] *Id.*, 5.

[10] *Id.*

- There is a substantial change in the intensity of competition that occurs in moving from three to four or more facilities-based carriers.[11]

(11) Emerging facilities-based competitors in Canada are thus particularly important for facilitating greater competition in the Canadian wireless industry, across all segments of the market. As I discussed in my initial white paper, recent empirical evidence indicates that wireless prices in Canada are significantly higher in regions that lack a strong facilities-based competitor to the national incumbents.[12] The OECD report focuses in particular on the role of new entrant "challenger" facilities-based carriers in spurring competition:

> When new entrants act as challengers they drive existing operators to improve their offers and performance. Generally, this leads existing operators to match the challenger operator, in other cases it leads to incumbents taking an additional step to get ahead. There is growing evidence for this in the case studies documented here in countries with at least four MNOs [mobile network operators].[13]

(12) The OECD report later cites an example from the United Kingdom, where a new entrant called "Three" "used disruptive pricing to gain market share, and its entrance had a downward effect on prices from which consumers continue to benefit"; the report notes that Three has "driv[en] both innovation and price competition in the United Kingdom."[14]

(13) The OECD report also presents a short case study on Canada specifically. Since 2008, Canada has pursued a policy of promoting competition in the wireless sector through setting aside spectrum for new entrants as well as implementing roaming and tower-sharing rules.[15] This approach has encouraged new facilities-based competition, according to the OECD.

> New entrants included regional cable operator Videotron in Québec and parts of Ontario; wireless only MNOs Wind Mobile and Mobilicity in major urban markets in Ontario, Alberta and British Columbia; and wireless only MNO Public Mobile in parts of Québec and Ontario. In 2013, regional cable operator Eastlink launched its wireless network in Nova Scotia and Prince Edward Island.[16]

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[11] *Id.*, 8.

[12] Initial white paper, § III.A.6.

[13] OECD report, 17. Note that the OECD and some initial interventions in this proceeding use the terms "MNO" and "MVNO" to represent what I call "facilities-based carriers" and "resellers," respectively.

[14] *Id.*, 48–49.

[15] *Id.*, 33.

[16] *Id.*

(14) The OECD report cites a 2014 Wall Communications study that found that "new entrant MNOs continue to offer prices that are substantially lower than incumbents, as much as 49 percent lower for smartphone wireless services."[17]

(15) Consistent with the Wall Communications study cited in the OECD report, a 2016 price comparison study prepared for the Canadian Radio-television and Telecommunications Commission (CRTC) also shows that new facilities-based entrants tend to offer lower prices. This study contrasts the price of services offered by incumbents to those offered by flanker brands and facilities-based new entrants across five types ("baskets") of service, with lower levels indicating more basic services and correspondingly lower price points. Figure 1 reproduces these results.[18]

[17] *Id*.

[18] NGL Nordicity Group Ltd., "2016 Price Comparison Study of Telecommunications Services in Canada and Select Foreign Jurisdictions," prepared for CRTC, Mar. 22, 2016, 31–33, *available at* http://www.crtc.gc.ca/eng /publications/reports/compar/compar2016.htm [hereinafter "Nordicity Price Comparison Study (2016)"].

Figure 1. Comparison of incumbent, new entrant, and flanker brand prices

City	Service provider type	Mobile wireless service basket level					
		Level 1	Level 2	Level 3	Level 4	Level 5	Average (city)
Halifax	Incumbents (I)	$38.76	$48.76	$77.10	$87.10	$108.76	$72.10
	Flanker (F)	$42.10	$50.10	$62.93	$77.93	$101.68	$66.95
	New entrant (N)	$30.55	$45.55	$70.55	$80.55	$110.55	$67.55
	Difference (N) versus (I)	–21.19%	–6.59%	–8.49%	–7.52%	1.64%	–6.31%
	Difference (N) versus (F)	–27.43%	–9.08%	12.11%	3.36%	8.72%	0.90%
Montreal	Incumbents (I)	$40.57	$44.40	$62.40	$70.40	$78.73	$59.30
	Flanker (F)	$36.14	$41.26	$51.24	$64.24	$77.80	$54.14
	New entrant (N)	$41.95	$41.95	$54.95	$64.95	$84.95	$57.75
	Difference (N) versus (I)	3.41%	–5.52%	–11.94%	–7.74%	7.90%	–2.61%
	Difference (N) versus (F)	16.08%	1.67%	7.24%	1.11%	9.19%	6.68%
Toronto	Incumbents (I)	$42.17	$51.50	$80.00	$90.00	$110.00	$74.73
	Flanker (F)	$36.20	$43.40	$60.24	$73.86	$89.76	$60.69
	New entrant (N)	$25.00	$25.00	$35.00	$35.00	$50.00	$34.00
	Difference (N) versus (I)	–40.71%	–51.46%	–56.25%	–61.11%	–54.55%	–54.50%
	Difference (N) versus (F)	–30.94%	–42.40%	–41.90%	–52.61%	–44.30%	–43.98%
Vancouver	Incumbents (I)	$42.17	$51.50	$80.00	$90.00	$110.00	$74.73
	Flanker (F)	$36.20	$43.40	$60.24	$73.86	$89.76	$60.69
	New entrant (N)	$25.00	$25.00	$35.00	$35.00	$50.00	$34.00
	Difference (N) versus (I)	–40.71%	–51.46%	–56.25%	–61.11%	–54.55%	–54.50%
	Difference (N) versus (F)	–30.94%	–42.40%	–41.90%	–52.61%	–44.30%	–43.98%
Average (level)	Incumbents (I)	$40.92	$49.04	$74.87	$84.37	$101.87	$70.22
	Flanker (F)	$37.66	$44.54	$58.66	$72.47	$89.75	$60.62
	New entrant (N)	$30.63	$34.38	$48.88	$53.88	$73.88	$48.33
	Difference (N) versus (I)	–25.15%	–29.91%	–34.72%	–36.15%	–27.48%	–31.17%
	Difference (N) versus (F)	–18.68%	–22.82%	–16.69%	–25.66%	–17.69%	–20.28%

Notes: Each of the four cities explicitly cited above had one new entrant: Eastlink (Halifax), Videotron (Montreal), Wind (Toronto and Vancouver). Five flanker brands included Bell Virgin, Rogers Fido, Telus Koodo, Rogers Chatr, and Mobilicity.
Source: Nordicity Price Comparison Study (2016), Table 7 and Table 8.

(16) As indicated in Figure 1, new facilities-based entrants exert substantial price pressure on incumbents, undercutting their offerings and those of incumbents' flanker brands. Entrants' prices for the same level of service are sometimes less than half of what incumbents charge: for example, an incumbent's Level 2 service offering (including 450 incoming and outgoing minutes per month and 300 text messages) in Vancouver costs $51.50 but was priced at only $25 by new entrant Wind (now Freedom Mobile).

(17) Attempting to promote reseller entry through mandated roaming (or other disruptive regulatory intervention in the retail market) threatens the development of these new entrant facilities-based carriers and the aggressive competition they provide. The parties supporting mandated wholesale

roaming access tend to downplay these effects and imply that reseller competition can be an effective substitute for increased facilities-based competition. That view is inconsistent with the evidence.

III.B. Reseller competition cannot substitute for a lack of facilities-based competition

(18) One party supporting mandated roaming agrees with the notion that Canada needs more facilities-based competition and says it "looks forward to the expansion of the 'new entrant' carriers," but claims that because this process is occurring too slowly in Canada, entry of resellers "may add needed dynamism to the market."[19]

(19) While the evidence shows that they are right to be concerned about the market power of the national incumbents, the OECD report cited in support of this position indicates that reseller competition is a poor substitute for increased facilities-based competition. The OECD report finds that "without sufficient wholesale competition it is unlikely [resellers] will be able to substitute for the role played by a 'challenger MNO'."[20] The OECD report also finds that weaker facilities-based competition is associated with less entry by resellers, a finding that dovetails with the theoretical and empirical evidence I presented in my initial white paper.[21]

(20) The OECD report also provides two case studies that show that following a merger of facilities-based carriers resulting in the loss of a fourth facilities-based competitor, reseller competition did not compensate for the loss of facilities-based competition.

- **Austria**: The 2013 merger between Hutchison-3G and Orange reduced the number of facilities-based carriers to three. A condition of the merger was that Hutchinson-Orange would allow wholesale access to its network for up to 16 mobile resellers over the following decade, if no new facilities-based carrier entered the market. Additionally, the merged entity agreed to divest spectrum to a new facilities-based entrant if one were to emerge. However, at the time of the 2015 OECD report, no new resellers had entered and no fourth operator had emerged. After the merger, prices jumped by eight to ten index points. "The overall outcome in the market has, therefore, been greater concentration and fewer players to exercise price discipline."[22]

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[19] PIAC initial intervention, ¶ 4: "Concerning the mobile wireless market, PIAC has historically supported increasing facilities-based competition, particularly via a fourth national wireless carrier. While PIAC continues to hold this position and looks forward to the expansion of the 'new entrant' carriers, we are aware that this competition will likely grow slowly. Therefore, the entry of other types of competitors, such as Wi-Fi First providers, may add needed dynamism to the market."

[20] OECD report, 8.

[21] *Id.*; initial white paper, §§ VI, VII.

[22] OECD report, 29–32.

- **Australia**: Following a merger that reduced the number of facilities-based carriers from four to three, both facilities-based carriers and resellers increased effective data prices for consumers and reduced the amount of data in their mobile bundles.[23]

[23] *Id*., 25–29.

IV. Expanding reseller access to mandated roaming undercuts facilities-based competition

(21) Given the need to improve facilities-based competition in Canada and the inability of reseller-based competition to fill the same role, it is important to consider the impact of any mandated reseller roaming proposal on facilities-based investment and competition. In Section IV.A., I reiterate and expand on the arguments I presented in my initial white paper. The parties supporting mandated wholesale roaming access for resellers tend to downplay the impact of mandated reseller roaming on investment in their initial interventions. PIAC's initial intervention is the most clear in its reasons for doing this. I respond to their arguments in Section IV.B below.

IV.A. Mandated reseller roaming access impairs incentives for facilities-based investment

(22) Shaw and other smaller facilities-based carriers are purchasing spectrum and building out infrastructure, thereby increasing their scope for further competition with the national incumbents.[24] This competition is already paying dividends, as recent studies have found that wireless prices in Canada are substantially lower in areas that have a strong alternative to the three national incumbents.[25]

(23) As I discussed in my initial white paper, a mandated reseller roaming regime promotes entry that bypasses the cost and risk of a facilities build-out. This type of entry without facilities investment increases the risk and decreases the returns for build-out and investment by facilities-based carriers. In this way, expanding regulated roaming rates to resale-based models (or some subset of them) reduces the payoff to facilities-based carrier investment and expansion. This effect is particularly acute on smaller facilities-based carriers.[26]

(24) In my initial white paper, I discussed how reseller entry via mandated roaming affected Shaw's investment models, reducing the number of regions that are likely to be commercially viable for Shaw to enter. In their initial interventions in this proceeding, the other regional facilities-based carriers describe a similar impact on their investment plans. Eastlink writes that

> Expanding the definition of "home network" to include Wi-Fi access would catastrophically undermine the economics for building wireless networks in rural

[24] *See* initial white paper, ¶ 34.

[25] *See id.*, § III.A.6, citing Competition Bureau of Canada, "Competition Bureau Statement Regarding Bell's Acquisition of MTS," news release, Feb. 15, 2017, *available at* http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/04200.html and Nordicity Price Comparison Study (2016).

[26] Initial white paper, ¶ 5, §§ IV, V.B.

> areas. The economics of network-based competition are already strained due to high cost of infrastructure deployment and smaller population bases to support return on investment (while offering competitive packages and rates to win customers), but are manageable with reasonable wholesale roaming rates and tower sharing rates. However, the Commission was correct when it determined that mandating resale of any kind would "significantly undermine network investments as a whole."[27]

(25) Videotron similarly argues that its ability to invest and innovate would be seriously undercut by the arrival of new reseller entrants via mandated reseller roaming.[28] SaskTel makes similar arguments also.[29]

(26) More comprehensively, as I noted in my initial white paper, a published study covering 58 network operators across 21 countries in the period 2000–2008 found that mandated provision of reseller access is related to lower investment intensity of facilities-based network operators.[30]

(27) One party supporting mandated wholesale roaming access for resellers confesses that it is not exactly sure of the overall impact on competition of such a policy. They write, "It is, at this time, difficult to conclusively predict the impact of an expanded definition of 'home network' on competition in the Canadian retail mobile wireless market."[31] But they nonetheless argue in favour of expanded reseller access to mandated roaming as if it had little impact on investment by facilities-based carriers.[32]

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[27] Eastlink initial intervention, Sept. 8, 2017, in the proceeding initiated by TNC 2017-259, ¶ 20.

[28] Videotron initial intervention, ¶ 38.

[29] Sasktel faces somewhat different investment incentives since it is owned by the government of Saskatchewan, but in its initial intervention in this proceeding it also argues that "We have always supported policies that encourage facilities-based competition as it has been our experience that innovation and service expansion will only occur when businesses that are willing to invest their capital in the development and delivery of service are rewarded for that investment. Policies that reward competitors who do not invest in facilities can have a short-term attraction of potentially lowering prices, but, in the long term, such a policy merely takes profit from the facilities based provider such as SaskTel. This impairs the business case and ultimately will reduce the ILECs actual investment. This harms consumers, businesses, and the whole economy." (SaskTel initial intervention, letter from the Honourable Joe Hargrave to Danielle May-Cuconato, Secretary General, Canadian Radio-television and Telecommunication Commission. Sept. 8, 2017, in the proceeding initiated by TNC 2017-259, 3).

[30] Jihwan Kim, Yunhee Kim, Noel Gaston, Romain Lestage, Yeonbae Kim, and David Flacher, "Access Regulation and Infrastructure Investment in the Mobile Telecommunications Industry," *Telecommunications Policy* 35 (2011): 907–19 [hereinafter "Kim et al. (2011)"].

[31] PIAC initial intervention, ¶ 8.

[32] Note that even PIAC acknowledges that Wi-Fi First providers should not gain access to mandating roaming rates on the same terms offered to MNOs but instead "specific conditions and rates should apply to Wi-Fi First providers within the wholesale roaming framework." (*Id*., ¶ 9).

IV.B. Arguments downplaying investment incentive effects and emphasizing welfare benefits of mandated reseller roaming are flawed

(28) PIAC's initial intervention presents the clearest articulation of the position that the impact of mandated reseller roaming on facilities-based investment would be minimal and that its consumer welfare benefits would be significant. It makes three primary arguments in support of this position.[33] I discuss these arguments below in turn. Each of these arguments is flawed, and the evidence they cite for support is often not on point or actually undercuts their argument.

IV.B.1. Argument 1: Academic research shows that consumer welfare is enhanced and investment not harmed by expanding wholesale access to resellers

(29) A consistent theme throughout PIAC's initial intervention is the conflation of reseller competition that occurs through voluntary partnerships with facilities-based carriers with the kind of mandated reseller roaming regime that is the subject of this proceeding. As I explained at length in my initial white paper, and as is corroborated by additional evidence presented in other initial interventions, robust facilities-based competition encourages reseller presence through voluntary partnerships with facilities-based carriers.[34] As a result, finding markets that have both a large reseller presence and a competitive wireless market is unsurprising and does not shed any light on the question of whether *mandated* reseller roaming helps or hurts wireless competition. Much of the evidence that PIAC cites, while consistent with the idea that facilities-based carriers and resellers can often have successful voluntary partnerships, does not address the question of the costs and benefits resulting from a mandatory wholesale roaming regime for resellers.

(30) In its initial intervention, PIAC writes,

> Academic research on the impact of expanding wholesale access to MVNOs [mobile virtual network operators] has not shown that MVNO entry in the market generates a significant negative impact on investment in wireless network infrastructure. Rather, research generally concludes that the consumer welfare gained by facilitated MVNO entry into the wireless service market outweighs any concerns about investment (in fact, in some cases MNOs readily partner with MVNOs to share the costs of network investments).[35]

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33 PIAC initial intervention, ¶¶ 57–69.

34 *See* initial white paper, §§ VI–VII. *See also, e.g.*, PIAC initial intervention, ¶ 36, citing OECD report, 70.

35 PIAC initial intervention, ¶ 7.

It later describes that “The research as a whole seems to indicate that MVNO entry . . . does not generate a significant negative impact on investment in wireless infrastructure.”[36]

(31) The initial intervention cites five academic papers in support of this argument: a 2006 paper by Kiiski, a 2008 paper by Lee, Chan-Olmsted, and Ho, a 2012 paper by Cricelli, Grimaldi, and Ghiron, a 2013 paper by Corrocher and Lasio, and a 2014 paper by Procházka.[37] None of these papers supports that intervention’s characterization of the findings in the academic research.

(32) The intervention claims, “the research as a whole seems to indicate that MVNO entry . . . does not generate a significant negative impact on investment in wireless infrastructure” and specifically cites the (pre-2006) experience in Finland as described by Kiiski (2006). However, Finland does not have a mandated reseller roaming access regime and so is not a good model for analyzing the impact of mandated access on infrastructure investment.[38] That study investigated whether investment would be affected by reseller competition, and found that it would not be “spoilt”—some investment in the new technology would still take place—but that “the [MVNO] competition slows down investments and innovation. . . .”[39]

(33) The intervention cites to Lee et al. (2008) to support the contention that facilities-based carriers can benefit from having reseller traffic on their network.[40] I agree. Voluntary arrangements between facilities-based carriers and resellers in many countries attest to this. However, this is irrelevant to the

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36 PIAC initial intervention, ¶ 64.

37 PIAC initial intervention, ¶¶ 24–25, 59, 60, 63; Annukka Kiiski, “Impact of MVNOs on Mobile Data Service Market,” 17th European Regional ITS Conference, Aug. 22–24, 2006 [hereinafter “Kiiski (2006)”]; Sangwon Lee, Sylvia M. Chan-Olmsted, and Hsiao-Hui Ho, “The Emergence of Mobile Virtual Network Operators (MVNOs): An Examination of the Business Strategy in the Global MVNO Market,” *International Journal on Media Management* 10 (2008): 10–21 [hereinafter “Lee et al. (2008)”]; Livio Cricelli, Michele Grimaldi, and Nathan Levialdi Ghiron, “The Impact of Regulating Mobile Termination Rates and MNO-MVNO Relationships on Retail Prices,” *Telecommunications Policy* 36 (2012): 1–12 [hereinafter “Cricelli et al. (2012)”]; Nicoletta Corrocher and Laura Lasio, “Diversification Strategies in Network-Based Services: The Case of Mobile Virtual Network Operators,” *Telecommunications Policy* 37, no. 11 (2013): 1110–23 [hereinafter “Corrocher and Lasio (2013)”]; Pavel Procházka, “Impact of Liberalization Policy on Mobile Market and Average Price per Minute in the EU,” *International Journal of Business Management* 2, no. 4 (2014): 110–34 [hereinafter “Procházka (2014)”].

38 “Access to mobile networks has not been subject to direct regulation in Finland, but the state authorities have encouraged MNOs to negotiate agreements with [service providers].” (National Regulatory Authorities of Norway, Finland, Sweden, Denmark, and Iceland, “Competition and Regulation in the Nordic Mobile Markets,” Sept. 2006, 5, *available at* https://www.pts.se/upload/Documents/SE/Competition_regulation_nordic_mobile_markets_sept06.pdf). The Finnish Communications Regulatory Authority (Ficora) proposed mandating reseller access, but the European Commission vetoed the proposal. (Dirk Grewe, András G. Inotai, and Stefan Kramer, “Two Recent Veto Decisions under the New Regulatory Framework for Electronic Communications: The Importance of Competition Law Principles in Market Analysis,” *Competition Policy Newsletter*, 1 (Spring 2005): 49, *available at* http://ec.europa.eu/competition/publications/cpn/2005_1_49.pdf). It is also notable that the study was conducted in the mid-2000s, at a time when investment in 3G networks was just beginning to take off.

39 Kiiski (2006), 7.

40 PIAC initial intervention, ¶ 59, citing Lee et al. (2008), 12.

question of whether a facilities-based carrier's incentive to invest is diminished by mandated access to resellers at regulated rates.

(34) Similarly, Cricelli et al. (2012) does not address questions of the impact of mandated reseller roaming on facilities-based investment. It assumes voluntary partnerships between network operators and resellers.[41] The authors of that paper find that "MNOs that sign collaborative deals with MVNOs doing business in market areas where the operator is not strongly represented achieve [a variety of benefits]."[42] Again, this fact is consistent with the idea that voluntary partnerships can be beneficial, but is not useful for understanding the impact of mandating reseller access on competition and investment.

(35) Corrocher and Lasio (2013) also does not speak to the issue of whether extending mandated roaming access to resellers would affect investment decisions of facilities-based carriers. Instead, the focus of the article is an evaluation of business strategies of resellers that enter wireless markets in Italy and France, two countries in which "negotiations between MNOs and MVNOs [happen] on a voluntary basis."[43] As noted by PIAC, the authors of this article point out that the entry of resellers has "raised concerns on the incentives for network carriers to keep investing in infrastructure."[44] The authors do not evaluate these concerns, nor do they consider evidence that might confirm or refute them.

(36) The intervention contends that the Procházka paper "also concludes that the entry of MVNOs in various European markets resulted in improved quality of mobile service and new offerings for customers."[45] The Procházka article purports to examine the relationship between wireless prices and the number of resellers in a market. The findings of this article are inconsistent with the inference PIAC draws from it, however. The author does not control for the level of facilities-based competition in each market or for country-specific factors more generally. He finds a slightly positive but statistically insignificant correlation between average price per minute and the number of resellers in each country in Europe. The author also reports a positive but statistically insignificant correlation between the number of resellers and price level in Western Europe,[46] and negative correlation between the number of resellers and prices in Eastern Europe.[47] The author does not attempt to distinguish between reseller entry caused by vigourous facilities-based competition and that caused by mandated reseller roaming access. One can therefore glean no evidence related to the impact of

41 PIAC initial intervention, ¶ 60.

42 Cricelli et al. (2012): 11.

43 Corrocher and Lasio (2013), 1114.

44 *Id*., 1113.

45 PIAC initial intervention, ¶ 25, citing Procházka (2014), 126.

46 *See* Procházka (2014), 121, Figure 11.

47 *See id*., 122, Figure 12.

expanding mandatory roaming access to resellers—either on incentives of facilities-based carriers to invest or on consumer outcomes—from this article.

(37) In fact, the academic research most relevant to this proceeding—the article by Kim et al. that I discussed in my initial white paper—finds that mandated provision of reseller access is related to *lower* investment intensity of facilities-based network operators.[48]

IV.B.2. Argument 2: Initial roaming regulation in Canada did not undercut investment incentives of national carriers

(38) PIAC also argues that Telecom Regulatory Policy 2015-177, mandating roaming for smaller facilities-based carriers in Canada, did not undercut investment incentives for the national incumbents, and therefore one should not expect much investment impact from the current proposal.[49] That argument misses important differences between that regulation and the current proposal.

(39) As discussed in my initial report, the 2015 roaming decision aimed to support additional facilities-based competition and investment by smaller regional carriers, and therefore was complementary to additional industry investment. In contrast, the reseller-access regime being considered in this proceeding would encourage substitution away from business models that are based on facilities investment. As I wrote in my initial white paper,

> To the extent that a change in roaming policy gives reseller models a status similar to facilities-based carriers, it acts as a substitute for investment and build-out rather than a complement. It diminishes the incentives of facilities-based carriers to improve and expand their networks, since a lower risk and quicker way to offer service to customers nationwide would be to roam on existing networks and use existing infrastructure. To the extent that long run returns are diminished as a result of resellers' entry, internal resources available to undertake costly investment will also be reduced.[50]

(40) This impact on incentives is likely to be larger on smaller carriers for whom build-out and other investment is large relative to their installed base than on the national incumbents.[51]

48 Kim et al. (2011).

49 PIAC initial intervention, ¶¶ 65–67.

50 Initial white paper, ¶ 7.

51 *Id*., ¶¶ 5, 32.

IV.B.3. Argument 3: Effects on investment incentives of new facilities-based carriers are more uncertain, but likely small

(41) In its initial intervention, PIAC concludes that the effects of the proposed policy change on investment incentives of new entrant carriers are likely to be small. At one point, PIAC emphasises the uncertainty of this impact: "[W]ith respect to new entrant carriers, it is difficult to substantiate at this time whether mandating wholesale roaming for Wi-Fi First providers would have a significant negative impact on the investments made by new entrant carriers."[52] Elsewhere, however, the initial intervention argues that the net effect on both incumbent national carriers and new entrants' investments of mandated wholesale roaming for Wi-Fi first providers would be small:

> [T]he Commission in [TRP 2015-177] decided not to mandate MVNO access because it found that permanent network access would "likely discourage continued investment by wireless carriers," particularly by new entrant carriers. In PIAC's view, mandating wholesale roaming for Wi-Fi First providers would not have a significant negative impact on investment—this is not, to PIAC's knowledge, substantiated by the conclusions made in relevant research and reports.[53]

(42) With regard to new entrants, PIAC notes, "[I]t is still preferable for a wireless provider to operate its own home cellular network rather than relying on wholesale roaming, and that therefore new entrants will likely need to continue to invest, particularly in order to compete with the national incumbent carriers."[54]

(43) While operating on a home network may make more economic sense for a facilities-based carrier than relying on roaming, if that is true it only shows that *some* incentives for investment and build-out likely still exist even with reseller roaming mandates. But no one is arguing that such incentives become zero with any reseller roaming mandates. The argument is rather about the incremental impact on investment incentives of mandated roaming. The evidence presented in this proceeding indicates that the impact can be significant and harmful to competition and consumers.

(44) As discussed in my initial white paper and revisited in Section IV.A of this supplemental white paper, Shaw's investment model indicates that mandated reseller roaming access would reduce its incentives for investment significantly and would likely make certain build-outs unprofitable. Other regional facilities-based networks have made similar representations in their initial interventions in this proceeding.

52 PIAC initial intervention, ¶ 68.

53 *Id.*, ¶ 38.

54 *Id.*, ¶ 68.

V. Improved facilities-based competition improves reseller access

(45) Resellers can play a role in enhancing offerings for consumers, particularly if they offer products or services that facilities-based carriers do not.[55] To the extent that there is a concern about these offerings making their way to consumers, however, that concern can be better addressed by policies that enhance facilities-based competition rather than by reseller roaming mandates.

(46) In my initial white paper, I emphasised that encouraging facilities-based competition would likely result in improved reseller access, ultimately achieving the same goal of increased choice and competition for consumers with less regulatory intervention.[56] I presented both theoretical and empirical evidence supporting these arguments.[57]

(47) I developed a model that showed how competition among facilities-based network operators gives these operators an increased incentive to sell roaming services at competitive rates to resellers and thereby promotes reseller access to facilities-based networks.[58] These increased incentives occur because with more facilities-based competition, increased operator revenue from the partnership starts to outweigh the potential losses from cannibalized sales and decreased retail prices.

(48) Empirical evidence cited in my initial report also demonstrates the upsides of promoting facilities-based competition and allowing resellers to emerge organically. This is most clearly evident in the success of the United States and the United Kingdom—two countries without regulatory intervention for wireless resellers—along a number of important dimensions:

- Reseller presence is strong in both the United States and United Kingdom.[59]
- Network investment in the United Kingdom is among the best of the European Union ("EU").[60]
- The United States, with relatively few regulatory interventions compared to the EU overall, has more network investment than the EU.[61]

(49) The initial intervention by PIAC points to instances of successful partnerships between facilities-based carriers and resellers as evidence of the virtues of reseller roaming mandates.[62] But it is

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55 Initial white paper, ¶ 9.

56 *Id.*, § VI.B.

57 *Id.*, §§ IV–VII.

58 *Id.*, ¶ 53.

59 *Id.*, §§ VII.A.4, VII.B.4.

60 *Id.*, § VII.B.3.

61 *Id.*, § VII.A.3.

62 PIAC initial intervention, ¶¶ 58–64.

important in this context to distinguish between the impact of *voluntary* "network sharing" arrangements that promote competition and encourage infrastructure investment and the impact of *mandated* reseller roaming access regimes. The examples that PIAC cites speak more to the former than the latter.

(50) The theoretical literature has argued that when both are options, competition generally is superior to regulation in achieving efficient outcomes.[63] Moreover, mandated roaming for smaller facilities-based carriers encourages their further investment in wireless infrastructure, while expanding mandated access to resellers diminishes the incentives for smaller facilities-based carriers to undertake risky investments.[64]

[63] *Id.*, ¶¶ 45–46.

[64] *Id.*, ¶ 47.

VI. International experience supports a focus on facilities-based competition as a way to improve reseller access and consumer welfare

(51) In my initial white paper, I discussed evidence of robust reseller presence in the United States and the United Kingdom, both markets without reseller access mandates but robust facilities-based competition.[65] I also noted that mandated reseller roaming access of the type contemplated in this proceeding was rare internationally.

(52) PIAC argues, in contrast, that reseller access to facilities-based networks is not uncommon:

> While not all jurisdictions outside Canada mandate MVNO access to MNO networks, policy makers have tended to do so where they determine that one or more incumbent MNOs have significant market power, or incentives to coordinate activities.[66]

(53) But broad mandated reseller access of a type contemplated in this proceeding is in fact rare internationally. Several countries that PIAC's initial intervention categorizes as having mandated reseller access actually have more limited mandates related to conditions for merger approval or spectrum auctions. As they explain, in Germany, the European Commission required Telefónica to offer wholesale 4G services to all interested resellers in the future as a condition to approve the merger between Telefónica and E-Plus.[67] However, mandated reseller access in Germany does not apply to all incumbents. That mandate targeted the merged entity, which agreed with the access obligation as a condition of consummating its merger. In addition, those tariffs are not regulated: Telefónica only committed to grant resellers access to its 4G network at the best available market terms and conditions.[68]

(54) Few countries have broad mandated reseller access based on findings of significant market power or joint dominance of wireless operators. The majority of these countries have a single or two dominant operators, such as in Cyprus and Norway.[69] Spain is the only European country that has mandated

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65 Initial white paper, §§ VII.A.4, VII.B.4.

66 PIAC initial intervention, ¶ 33.

67 *Id.*

68 Summary of Commission Decision of July 2, 2014 declaring a concentration compatible with the internal market and the functioning of the EEA Agreement (Case M.7018 — Telefónica Deutschland/E-Plus), 2015/C 86/07, ¶ 29, *available at* http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015XC0313(01).

69 Ewan Sutherland, "The Regulation of National Roaming," 22nd European Regional Conference of the International Telecommunications Society, Budapest, Sept. 2011, 16; National Regulatory Authorities of Norway, Finland, Sweden, Denmark, and Iceland, "Competition and Regulation in the Nordic Mobile Markets," Sept. 2006, 6–7, *available at* https://www.pts.se/upload/Documents/SE/Competition_regulation_nordic_mobile_markets_sept06.pdf.

reseller access based on findings of joint dominance of three operators, and it has recently rescinded that mandate.[70]

(55) PIAC's initial intervention also says, "[E]xperiences in other jurisdictions show MVNOs more broadly can also cater to a range of different consumer segments with different needs."[71] But these other jurisdictions typically do not have mandated reseller roaming access. In the United States and the United Kingdom, for instance, resellers are thriving without mandated access through voluntary agreements. In the United States, hundreds of independent resellers serve around 10% of wireless subscribers; in the United Kingdom, resellers had a 15% share of retail mobile subscriptions at the end of 2015.[72] As shown in one figure of the PIAC initial intervention, the Netherlands has the leading reseller market share and the third largest number of reseller players of the countries surveyed.[73] Yet, as of 2006, all access regulations had been withdrawn in the Netherlands, so the success of resellers there cannot therefore be attributed to mandated access regulation.

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70 In 2005, the Spanish national telecom regulator at that time, Comisión del Mercado de las Telecumunicaciones (CMT), found that Vodafone, Telefónica, and Amena jointly had collective dominance and tacitly agreed not to grant access to resellers. With the European Commission's approval in 2006, the CMT imposed mandated wholesale access and required the operators to offer access to resellers on reasonable terms (European Commission, "Competition: Commission Endorses, with Comments, Spanish Regulator's Measure to Make Mobile Market More Competitive," news release, Jan. 31, 2006, *available at* http://europa.eu/rapid/press-release_IP-06-97_en.htm). In February 2017, the current Spanish telecom regulator, Comisión Nacional de los Mercados y la Competencia (CNMC), notified the European Commission of its plan to deregulate reseller access. (European Commission, "Europe's Digital Progress Report 2017," Spain telecoms chapter, 3, *available at* https://ec.europa.eu/digital-single-market/en/news/europes-digital-progress-report-2017-country-profiles-telecom-country-reports).

71 PIAC initial intervention, ¶ 5.

72 Olga Kharif, "The Phone Companies People Actually Love," *Bloomberg Businessweek*, Feb. 4. 2016, *available at* https://www.bloomberg.com/news/articles/2016-02-04/the-phone-companies-people-actually-love; OFCOM, "The Communications Market 2016," 154, *available at* https://www.ofcom.org.uk/__data/assets/pdf_file/0026/26648/uk_telecoms.pdf. Note that this number may include some resellers that are owned by major brands.

73 PIAC initial intervention, 27, Figure 7.

VII. Conclusion

(56) I agree with one primary point made in the initial interventions of parties supporting mandated wholesale roaming access: that additional competition could improve consumer welfare in the Canadian wireless market. I disagree, however, that mandating forms of reseller access to wholesale roaming would achieve that end in a meaningful and lasting way. Theory and experience have shown that robust facilities-based competition is necessary for lower prices and improved services, and that mandated reseller access is not a substitute for facilities-based competition. In fact, a reseller roaming mandate of the type contemplated in this proceeding would undercut incentives for improved facilities-based competition and undermine progress that is already occurring in Canada. Such a mandate risks real harm to competition in the Canadian wireless market.

Appendix A. Curriculum vitae of Eric R. Emch

SUMMARY OF EXPERIENCE

Dr. Eric Emch has nearly 20 years of experience in the economic analysis of competition issues, including the competitive effects of horizontal and vertical mergers, analysis of single-firm conduct and monopolization, market definition, and collusion. His recent work has focused on merger and monopolization issues in a variety of industries, including the wireless telecommunication and oilfield services industries.

Dr. Emch joined Bates White from the Antitrust Division of the US Department of Justice (DOJ), where he served as Staff Economist and Assistant Chief of the Competition Policy Section. As Assistant Section Chief, Dr. Emch led teams of economists in theoretical and empirical analyses of merger, monopolization, and collusion cases primarily in the transportation, energy, and payment cards sectors. This included hiring and collaborating with outside economic experts, strategizing with legal teams on case approach, and incorporating economics into case development. As a staff economist, he conducted theoretical and empirical analysis in support of merger and non-merger investigations in a wide variety of industries, including support for the DOJ litigation team in United States v. Visa. He also prepared to be a testifying expert in two merger cases.

From 2007 to 2008, while on leave from the DOJ, Dr. Emch served as a Senior Economist at the Paris-based Organisation for Economic Co-operation and Development (OECD). In that role he led the OECD's Regional Competition Center in Seoul, Korea, where he designed, organized, and conducted competition policy training workshops for staffers of national competition authorities across Asia. Dr. Emch has continued his work in international antitrust enforcement at Bates White. In 2011 and 2014, he organized and led workshops for Asian competition authorities in Thailand, Vietnam and Korea. In December 2012 and March 2013, he led workshops in Budapest, Hungary for staffers of competition authorities in the region on competitive analysis of abuse of a dominant position. He has also presented seminars on antitrust before audiences at the Japanese Fair Trade Commission, the Korea Fair Trade Commission, the China Ministry of Commerce (MOFCOM), and the China State Administration of Industry and Commerce (SAIC), among others.

Dr. Emch has published in journals such as the *Journal of Industrial Economics*, *Review of Industrial Organization*, *Review of Network Economics*, and *Antitrust Law Journal* on a number of competition-related topics, including aftermarket effects, two-sided markets, and non-horizontal merger theories of harm. He has also taught econometrics in Johns Hopkins University's Masters of Applied Economics Program.

EDUCATION

- PhD, Economics, University of California at Berkeley, 1999
- AB, Economics and History, Brown University, 1991

PROFESSIONAL EXPERIENCE

- Partner, Bates White Economic Consulting, January 2014–present
- Principal, Bates White Economic Consulting, April 2011–January 2014
- Research Economist, DOJ Antitrust Division, January 2009–April 2011
- Senior Economist, OECD Competition Division, Paris, France, September 2007–December 2008
- Assistant Chief, DOJ Antitrust Division Competition Policy Section, August 2004–August 2007
- Economist, DOJ Antitrust Division, October 1999–August 2004

SELECTED BATES WHITE EXPERIENCE

- Prepared economic analysis on behalf of the Canadian Competition Bureau in support of its review of the acquisition of Manitoba Telecom Services, Inc., by BCE Inc.
- Prepared economic analysis and submitted declaration before the FCC discussing the role of competition and the definition of dominant carrier in a proceeding relating to special access tariffs.
- In *In re Determination of Rates and Terms for Making and Distributing Phonorecords*, led a team supporting the expert in preparing testimony on behalf of Spotify USA Inc. regarding royalty payments under Section 115 of the Copyright Act.
- Led the team supporting the expert on behalf of the US Department of Justice in its successful challenge of the proposed $34.6 billion merger of Halliburton and Baker Hughes.
- Led the team providing analysis and expert support for DOJ in analyzing the proposed merger of silicon metal producers FerroAtlantico and Globe Specialty Metals. Analyzed the competitive effects of the proposed transaction, and supported preparation of expert testimony in the event of a merger challenge. After an extended investigation, the Department did not challenge the merger, which was subsequently consummated.
- Led a team assessing the potential competitive effects of AT&T's proposed $48 billion acquisition of DirecTV during an extended review of the transaction by the DOJ and FCC. Analyzed competition and complementarities among broadband Internet and video programming services on behalf of AT&T. The merger was ultimately approved by both agencies.

- On behalf of Constellation Brands, analyzed the competitive effects of Anheuser-Busch InBev and Grupo Modelo's proposed divestiture of brewery and distribution assets to Constellation in response to DOJ's concerns about their proposed merger. Coauthored a white paper positing that the proposed divestiture resolved the concerns initially raised and would likely improve competition relative to the status quo. DOJ ultimately approved the merger, subject to the proposed divestiture package.
- Retained by DOJ's Antitrust Division to produce an expert report and serve as an expert witness for a proposed merger in the publishing industry. Analyzed competition between the merging firms, product and geographic market definition, potential unilateral and coordinated effects avenues of merger harm, and effects on final consumers. Merger was eventually approved after parties proposed a divestiture package resolving potential competitive concerns.
- Retained by DOJ's Antitrust Division to produce an expert report and serve as an expert witness for a proposed merger in the energy services industry. Merger was eventually approved after parties proposed a divestiture package resolving potential competitive concerns.
- On behalf of Express Scripts and Medco Health Solutions, provided economic analysis on a wide range of competitive issues that the FTC explored during its eight-month investigation of their merger. Demonstrated that the proposed transaction would not meaningfully put the combined company in a position to exercise market power in any relevant market or market segment. This analysis, which Bates White presented to the FTC, supported the agency's conclusion that there is a dynamic, competitive market for PBM services and that the proposed acquisition would not change this. The FTC closed its investigation after finding no likelihood of future unilateral effects, coordinated effects, or exercise of monopsony power resulting from the merger.
- On behalf of DuPont, provided economic analysis in an antitrust case against Kolon Industries related to sales of para-aramid fiber in the United States. The case involved monopolization counterclaims filed by Kolon against DuPont, subsequent to another case brought by DuPont that claimed theft of trade secrets. Kolon alleged that the use of certain supply agreements between DuPont and some of its customers was illegal exclusionary conduct under Section 2 of the Sherman Act and claimed damages for Kolon. Bates White provided expert testimony showing that DuPont is not a monopolist in the market for para-aramid fiber and that the supply agreements at issue are not detrimental to competition. DuPont was granted summary judgment in its favor, and Kolon's antitrust counterclaims were dismissed with prejudice.
- On behalf of an international competition authority, drafted new merger control regulations and merger enforcement guidelines.
- Developed and led four workshops for staff of Asian antitrust authorities on behalf of the OECD: (1) a workshop on "Cartel Fundamentals" for ASEAN member countries in Bangkok, Thailand in September 2014; (2) a workshop on monopolization and abuse of dominance in Jeju, Korea in June 2014; (3) a workshop on "Legitimate Business Practices or Cartels in Disguise?" in Hanoi,

Vietnam in October 2011; and (4) a workshop on monopolization and abuse of dominance in Busan, Korea in December 2011. Participants included staff from the competition authorities of China, India, Indonesia, the Philippines, Pakistan, Vietnam, Singapore, Myanmar, Malaysia, and Mongolia, among others.

- Developed and led workshops on pricing-related abuse of dominance and exclusionary practices for staff members of Eastern European competition authorities in Budapest, Hungary in December 2012 and March 2013 on behalf of the OECD.

SELECTED DEPARTMENT OF JUSTICE EXPERIENCE

- Led teams of economists evaluating economic theory and empirical evidence for cases in the transportation, energy, and payment cards sectors.
- Oversaw the analysis of effects on electricity prices from the merger of two large suppliers on the same regional interchange. Work included detailed merger simulation and analysis of the effects of long-term contracting on supply, and an analysis of how potential divestitures would affect postmerger pricing.
- Examined potential exclusionary conduct in payment cards markets, including theoretical modeling of potential anticompetitive effects.
- Provided support to Antitrust Division expert and trial team in *United States v. Visa USA*. Assisted with depositions of opposing experts and reviewed expert reports.
- Led economics teams in defining and analyzing possible non-horizontal effects of mergers in several cases in the software and manufacturing industries. Conducted extensive theoretical and empirical analyses of possible competitive effects from non-horizontal aspects of the proposed merger of General Electric and Honeywell in 2001.
- Worked with attorneys in incorporating economic content into legal arguments and in rebutting arguments of opposing economics experts in *United States v. First Data Corp.*
- Prepared as a testifying expert in two merger cases in the computer software industry. Conducted analyses of the transactions, including modeling of the competitive effects and data analysis to support theoretical predictions, and prepared draft expert reports.
- Conducted empirical analysis related to competitive effects and market definition in airline markets for inclusion in the Antitrust Division’s comments to the Department of Transportation on a proposed swap of takeoff and landing rights between airlines.

SELECTED OECD EXPERIENCE

- Oversaw the development and implementation of training and outreach activities directed at staffers at emerging competition authorities in Asia.

- Developed a series of training workshops in Hanoi, Vietnam; Busan and Seoul, South Korea; and Singapore focused on merger policy, cartel enforcement, antitrust aspects of competitor collaborations, quantitative analysis in competition policy enforcement, and monopolization and abuse of dominance. Representatives from virtually all national competition authorities in Asia participated in one or more the workshops.
- Designed, organized, and led workshops on competition policy enforcement for China's Ministry of Commerce (MOFCOM) and State Administration for Industry and Commerce (SAIC).

PAPERS AND PUBLICATIONS

- Armington, Elizabeth, Eric R. Emch, and Ken Heyer. "The Year in Review: Economics at the Antitrust Division, 2005–2006." *Review of Industrial Organization* 29, no. 4 (2006): 305–26.
- Emch, Eric R. and T. Scott Thompson. "Market Definition and Market Power in Payment Card Networks." *Review of Network Economics* 5, no. 1 (2006): 45–60.
- Emch, Eric R., Ken Heyer, and Robert Majure. "The Year in Review: Economics at the Antitrust Division, 2004–2005." *Review of Industrial Organization* 27, no. 3 (2005): 197–221.
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- Dick, Andrew W., Aaron Edlin, and Eric R. Emch. "The Savings Impact of College Financial Aid." *Contributions to Economic Analysis & Policy* 2, no. 1 (2003). http://www.bepress.com/bejeap/contributions/vol2/iss1/art8.
- Edlin, Aaron and Eric R. Emch. "The Welfare Effects of Price Matching Policies." *Journal of Industrial Economics* 47, no. 2 (1999): 145–67.
- Emch, Eric R. "Does Opportunism Explain Markups in Laser Printer Toner and Memory? No and Yes; Evidence on aftermarket pricing for laser printers." *Department of Justice Discussion Paper* EAG 02-3, March 2002.

SELECTED PRESENTATIONS

- "Antitrust Mergers Workshop." ABA Section of Antitrust Law, September 28, 2017
- "Merger Enforcement." Panelist, 11th Annual Global Antitrust Enforcement Symposium, Georgetown Law, September 12, 2017

- “Fundamentals of Antitrust Economics Series: Market Power.” Teleconference presentation, ABA Section of Antitrust Law, January 17, 2017
- “Price Discrimination Markets in Merger Cases: from Investigations to Courtrooms.” Teleconference presentation, ABA Section of Antitrust Law, May 18, 2016
- “Fundamentals of Antitrust Economics Series: Market Power.” Teleconference presentation, ABA Section of Antitrust Law, March 10, 2016
- “Fundamentals of Antitrust Economics Series: Coordinated and Vertical Effects.” Teleconference presentation, ABA Section of Antitrust Law, February 13, 2015
- “Merger remedies in theory and practice.” Panel moderator, 2014 Hal White Antitrust Conference, Bates White Economic Consulting, Washington, DC, June 9, 2014
- “Deviation in Dominance: Why is your client a monopolist there but not here?” Teleconference panelist, ABA Section of Antitrust Law, February 18, 2014
- “The Economics of Vertical Foreclosure.” Panelist, 2013 Hal White Antitrust Conference, Bates White Economic Consulting, Washington, DC, June 3, 2013
- “Fundamentals: Antitrust Economics.” Panelist, 61st ABA Antitrust Law Spring Meeting, Washington, DC, April 2013
- “Antitrust in Asia: Recent developments in China, Japan, and Korea.” Presentation, Dechert LLP, Washington, DC, August 1, 2012
- “Using Data and Economic Logic to improve Antitrust Enforcement.” Presentation, Workshop for the Chinese Ministry of Commerce, sponsored by the Asian Development Bank, Lijiang City, People’s Republic of China, 2009
- “Antitrust Approaches to Partial Equity Investments.” American Antitrust Institute 9th Annual Energy Roundtable, Washington, DC, 2009
- “Competition Enforcement versus Sector Regulation: An International Perspective.” Presentation, Korean Competition Law Association International Symposium, Seoul, South Korea, 2008
- “The Theory and Application of Competition Policy.” Presentation, International Symposium for Antitrust Enforcement, State Administration for Industry and Commerce, Beijing, People’s Republic of China, 2007
- “Merger Policy: An International Perspective.” Seminar, Shanghai University of Finance and Economics, Shanghai, People’s Republic of China, 2007
- “The US Electricity Market: The Economics of the Exelon/PSEG Merger.” Presentation, Workshop on the Liberalization of Electricity Markets, OECD Regional Competition Center, Budapest, Hungary, 2007

- “The Economics of Tying and Bundling.” Presentation, International Seminar on Abuse of Dominance, sponsored by OECD and the Antimonopoly Office of the Slovak Republic, Bratislava, Slovakia, 2007
- “Market Definition and Market Power in Payment Card Networks.” Presentation, Antitrust in Two-Sided Industries, eSapience conference, Boston, MA, 2006
- “The Economics of Vertical Mergers.” Training session for Antitrust Division lawyers and economists, Washington, DC, 2005
- “The Competitive Effects of Horizontal Mergers: Unilateral and Coordinated.” Annual training session for new Antitrust Division lawyers and economists, Washington, DC, 2003–2005
- “Competition Policy and Value Creation.” Presentation, Productivity, Innovation, and Value Creation Conference, Conference Board, Amsterdam, Netherlands, 2004
- “GECAS and the GE/Honeywell Merger.” Presentation, CRA International, Washington, DC, 2004
- “Market Definition in Payment Systems.” Presentation, NY State Bar Association, New York, NY, 2004
- “Vertical Foreclosure in the Aircraft Engine Market? The Role of GE Capital Aviation Services in Killing the GE/Honeywell Merger.” Presentation, INFORMS Marketing Science Conference, University of Maryland, College Park, MD, 2003
- “Antitrust Principles.” Training sessions, Hungarian Office of Competition, Budapest, Hungary, 2001
- “Merger Analysis.” Workshop, Romanian Office of Competition, Timisoara, Romania, 2001
- “The Role of Economics in Antitrust.” Presentation, NEI, Rotterdam, Netherlands, 2000

COURSES TAUGHT

- Graduate Microeconometrics, Johns Hopkins University
- Undergraduate Industrial Organization and Public Policy, UC Berkeley

PROFESSIONAL ASSOCIATIONS

- American Bar Association
- American Economic Association
- Industrial Organization Society

REFEREE

- American Economic Review

- B.E. Journals in Economic Analysis and Policy
- Journal of Industrial Economics
- Review of Industrial Organization

DISTINCTIONS AND HONORS

- Who's Who Among International Competition Economists, 2014–present
- Antitrust Division Award of Distinction, 2004
- Victor Kramer Foundation Fellowship, 2002–2003
- Alfred P. Sloan Foundation Doctoral Dissertation Fellowship, 1998–1999
- UC Berkeley Department of Economics Fellowship, 1997–1998
- Olin Foundation Fellowship in Law and Economics, 1996–1997
- IBER Distinguished Graduate Fellowship, 1994–1995
- Flood Fellowship in Economics, 1993–1994
- Class of 1873 Prize for Excellence in Economics, Brown University, 1991