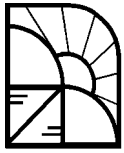


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## AN ECONOMIC APPROACH FOR EVALUATING A NATIONAL WIRELESS REGULATORY FRAMEWORK

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*Abstract:* In this POLICY BULLETIN, we provide a focused economic analysis of the welfare effect of state and local regulation on communications services and, in particular, on the wireless segment of the telecommunications industry. We find that when local regulation in one jurisdiction has sufficiently large “extra-jurisdictional” effects in other locations, overall social welfare can be reduced *even if state and local governments act as efficient regulators*. This finding is important because it shows that the debate over the proper regulatory framework for the wireless industry need not be driven by an assessment of which set of regulators, federal or state, is more competent. Accordingly, because state and local regulation in the wireless industry has the tendency to spill across borders, our analysis suggests that society is likely better to be off with a single, national regulatory framework for wireless services.

### I. Introduction

One of the longest-running debates in telecommunications policy in the United States is the division of regulatory responsibilities between the Federal, state and local governments. While this debate often focuses upon which political jurisdiction is likely to produce the “best” or optimal regulatory policy, the debate often turns into a discussion about which set of regulators

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are more responsive to consumer interests and that possess relevant expertise.<sup>1</sup> In this POLICY BULLETIN, we take a slightly different approach to this discussion, as we provide a focused economic analysis of the welfare effect of state and local policymaking in the telecommunications industry.

We find that when regulation in one jurisdiction has substantial effects in other jurisdictions, consumers and society can be worse off if local regulation is permitted to occur – *even if state and local governments act as efficient regulators* for their own jurisdiction. Indeed, we make no claims about whether state regulators are “better” or “worse” than federal regulators. In fact, the core of our approach shows that even if states enact regulatory policies that are tailored to maximize welfare within their jurisdiction, overall social welfare may nonetheless be lessened if there are “extra-jurisdictional effects” of that action. In essence, state regulators participate in a type of “prisoner’s dilemma,” where the decision that maximizes the welfare of their own citizens can render a lower level of social welfare across multiple jurisdictions.<sup>2</sup> This finding is important because it shows that the debate over the proper regulatory framework for the industry need not be driven by an assessment of which set of regulators, federal or state, is more competent.

Moreover, our approach does not require one to argue or assume that firms will exit the state or fail to invest in a state if the state makes an incorrect policy choice. Instead of focusing on competence or changes in industry structure, therefore, our approach places the focus squarely upon the size and scope of extra-jurisdictional effects and the gains from local of industry regulation that better matches constituency preferences. As our model demonstrates, *infra*, unlike situations in which state commissions have been asked to implement policies pursuant to consistent federal guidelines,<sup>3</sup> permitting unfettered state regulation of an industry characterized by extra-jurisdictional effects and spillovers *may* harm social welfare—even if states enact policies that maximize the welfare of their own constituents.

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<sup>1</sup> For a general review and discussion of these viewpoints, see J.R. Haring & K.B. Levits, *The Law and Economics of Federalism in Telecommunications*, 41 FED. COMM. L.J. 261 (1989).

<sup>2</sup> In the prisoner’s dilemma, two players may cooperate or betray each other. Each player maximizes his own expected payoff, without any concern for the other player. In the standard form of this game, defection always dominates cooperation, so the only equilibrium is for all players to defect. In other words, whatever the choices of the other player, defection is always the best choice. However, cooperation, if it could be achieved, renders a better outcome for both players.

<sup>3</sup> See PHOENIX CENTER POLICY BULLETIN NO. 9, *Federalism in Telecommunications Regulation: Effectiveness and Accuracy of State Implementation of TELRIC in Local Telecoms Markets* (Mar. 2004) (available at: <http://www.phoenix-center.org/PCPB9Final.pdf>); see also *In the Matter of The Public Utility Commission of Texas*, CC Policy Docket Nos., 96-13, 96-14, 96-16 and 96-19, Memorandum Opinion and Order, FCC No. 97-346 (rel. Oct. 1, 1997) (“*Texas Build-Out Preemption Order*”).

The choice of regulatory authority is, as always, based on a comparison of costs and benefits. We note that even in the presence of extra-jurisdictional effects, state and local actions may not always reduce aggregate social welfare when extra-jurisdictional effects are present. As a result, the scope of preemption in telecommunications regulation should not turn solely upon questions of relative competence or motivations of the local *regulator* but necessarily must take into account the size and scope of the extra-jurisdictional effects and the benefits of decentralized and differentiated forms of *regulation* itself.

Our findings are particularly relevant with regard to the appropriate regulatory framework for mobile wireless services. It is difficult to conceive of a communications service that more exemplifies “interstate commerce” than mobile telephony, which gives users the ability to make and receive calls virtually nationwide and not simply at the location where they purchased the service or to where the monthly bill is sent. Because wireless services are generally sold with national and uniform prices, terms and conditions, local and state regulation of wireless communications can affect consumers in every part of America. However, Section 332 of the Communications Act divides authority over the regulation of commercial mobile services between federal and state governments. States are preempted from engaging in rate regulation of commercial mobile services, but states are permitted to regulate “other terms and conditions.”<sup>4</sup> This uneasy division of authority has prompted calls for legislation that would clarify these roles—proposals that range from broad and explicit preemption of all state authority to similarly-broad and explicit preservation of state authority. Since we believe extra-jurisdictional effects are likely to be significant in the wireless industry, our analysis suggests that the regulation of wireless communications services should have a decidedly national bias.

We understand that there may be reasons other than economic efficiency and social welfare, narrowly construed, that a policymaker may prefer to decentralize and delegate regulatory authority. In particular, liberty and democracy interests are often cited as reasons for preventing the accumulation of power in the Federal Government. We do not deny the importance of those interests and concerns. That said, we hope that our analysis here helps regulators make better choices and that policymakers ought to understand the economic implications of decisions they make. If they choose to override those economic implications in favor of other interests, then perhaps our framework can provide a useful context for better understanding that decision.

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<sup>4</sup> 47 U.S.C. § 332(c)(3)(A); see *CTIA v. FCC*, 168 F.3d 1332 (D.C. Cir. 1999). States do have the ability to request ratemaking authority if the state proves to the FCC that “market conditions with respect to such services fail to protect subscribers” from unjust, unreasonable, or discriminatory rates, or that “such service is a replacement for land line telephone exchange service for a substantial portion of the telephone land line exchange service within such State.” *Id.* The FCC has granted no such request by a state since this provision was enacted.

## II. Extra-Jurisdictional Effects and Federalism

The proper division of authority between local, state and federal government lies at the heart the United States system of government, and this debate dates back to well before the Communications Act of 1934, if not the founding of the Republic. In general, those that favor federal preemption tend to believe that left to their own devices, states will make poor regulatory decisions—the “race to the bottom”—while state proponents believe that state policymaking results in better quality decisions overall—the “race to the top.”<sup>5</sup>

Assertions that states have better knowledge or expertise over local conditions, that states are more accountable to the people, that there is value in having states “experiment” with policies, and that the federal government is more likely to fail at regulatory oversight are essentially restatements and refinements of this same refrain. For example, one commentator has stated that “[i]ntuition suggests that with fifty different parallel state governments, and countless substate governments as well, innovations in governing or problem solving will occur that will inure to the benefit of the entire populace in the long run.”<sup>6</sup> Haring and Levitz (1989) make this point with regard to the break-up of the Bell System in 1984, which they assert led to state regulatory responses that “offered a textbook example of how decentralized authority, in this case over intrastate telecommunications policy, led to the testing of a wide range of public policy alternatives.”<sup>7</sup>

These are largely normative statements, however, that are not necessarily correct. In fact, opponents of decentralized regulatory authority often argue that government actors will instead “race to the bottom” and enact regulations that are not in the best interests of their citizenry. As described by Bratton and McCary (1997), without federal oversight, the political

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<sup>5</sup> Good summaries of the Federalism debate in communications are provided by P. Weiser, *Cooperative Federalism and its Challenges*, 2003 MICH. ST. U.-DCL J. INT’L L. 727 (2003); P. Weiser, *Federal Common Law, Cooperative Federalism, and the Enforcement of the Telecom Act*, 76 N.Y.U. L. REV. 1692 (2001); and R. Hahn, A. Layne-Farrar, and P. Passell, *Federalism and Regulation*, REGULATION 46 (Winter 2003-2004).

<sup>6</sup> B. Friedman, *Valuing Federalism*, 82 MINN. L. REV. 317, 397 (1997). As Justice Brandeis famously stated, “It is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.” *New State Ice Co. v. Liebmann*, 285 U.S. 262, 311 (1932); see also *United States v. Lopez*, 514 U.S. 549, 581 (1995) (Kennedy, J., concurring) (stating that “the theory and utility of our federalism” is that “States may perform their role as laboratories for experimentation to devise various solutions where the best solution is far from clear.”).

<sup>7</sup> Haring & Levitz, *supra* n. 1 at 274.

subdivision is “forced to cater” its policies to an “identified class of itinerant at-the-margin consumers, rather than by a dispassionate and responsible calculation of the public welfare.”<sup>8</sup>

Another argument against decentralized regulation is the concept of “regulatory externalities” or “extra-jurisdictional effects.” These concepts describe cases where the effects of regulatory decisions in one jurisdiction may adversely influence the cost and benefits in another jurisdiction. Extra-jurisdictional effects of state and local regulations are an important component of the debate over Federalism as applied to telecommunications policy and we are certainly not the first to recognize their importance. As stated by former FCC Chief Economist Michael L. Katz (2001),

Public policy toward the provision of telecommunications services in one area may affect the provision of services in other areas. For example, charges for the completion of long-distance telephone calls clearly will affect the welfare of parties in areas where the calls originate. The effects of regulation on competition also may create jurisdictional externalities. For example, policies that make entry difficult in one geographic area may raise the overall cost of entering the industry and thus reduce the speed at which entry occurs in other areas.<sup>9</sup>

Particularly in the wireless communications industry, competition or consumer marketing demands frequently cause firms to have a national uniform pricing structure and uniform, comprehensive billing systems.<sup>10</sup> The competitive and technology conditions of such communications services do not generally permit a provider to establish fifty different business models, one for each state. In that situation, a regulatory environment that differs from state-to-state can erode a provider’s ability to offer cost-efficient service through uniform national service and pricing plans.<sup>11</sup> Similarly, if one state tries to force an industry to re-design

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<sup>8</sup> See, e.g., W. W. Bratton & J.A. McCary, *The New Economics of Jurisdictional Competition: Devolutionary Federalism in a Second-best World*, 80 GEO. L.J. 201, 217 (1997) (“Supporters [of federalism] argue that the ensuing race-to-the-top will ensure a high standard of government service. Opponents answer that competitive government actors will forsake their public mission and thereby race-to-the-bottom.”).

<sup>9</sup> M.L. Katz, *Regulation: The Next 1000 Years*, in SIX DEGREES OF COMPETITION: CORRELATING REGULATION WITH THE TELECOMMUNICATIONS MARKETPLACE (Aspen Inst. 2000) at 44.

<sup>10</sup> See, e.g., *In the Matter of Truth-in-Billing and Billing Format*, 20 F.C.C.R. 6448 (2005) at ¶¶ 49-54 (available at: [http://fjallfoss.fcc.gov/edocs\\_public/attachmatch/FCC-05-55A1.pdf](http://fjallfoss.fcc.gov/edocs_public/attachmatch/FCC-05-55A1.pdf)) at ¶¶ 49-54.

<sup>11</sup> As noted by former FCC Chief Economist Thomas W. Hazlett, “[w]hen economic realities dictate that production of goods is efficiently done across jurisdictions (i.e., economies of scale stretch beyond state borders), decentralized regulations lack effective feedback.” T.W. Hazlett, *Is Federal Preemption Efficient in Cellular Phone Regulation?*, 56 FED. COMM. L.J. 155, 176 (2003).

multistate facilities or services solely to meet that single state's individual mandate, and if a firm cannot confine those state-imposed cost increases to the particular state, then the increased costs will have an effect across the industry and not simply in the state that established the regulation. One such example is the continued effort in California to enact a telecommunications "Bill of Rights" that would regulate such matters as font size in bills.<sup>12</sup> In sum, unless new costs imposed by one local or state authority can be contained to the local jurisdiction, those costs will tend to raise prices for consumers everywhere and possibly alter industry structure. Importantly, while the incremental impact of any one local regulation may be tiny, the presence of dozens of such changes can have a large cumulative impact and add significant costs for society.

Several studies contend that state and local regulation of wireless services can have extra-jurisdictional effects. Hazlett (2003) has noted that the industry "has gravitated to national networks because of economic efficiency, not due to regulatory constraints or path dependency."<sup>13</sup> Because mobile services are, by definition, mobile, the consumer can cross state and local political boundaries while using the service. For example, a quality of service mandate by the State of Maryland for wireless consumers that have their service billed in Maryland will by necessity require service providers to upgrade their networks in the District of Columbia, Virginia, Pennsylvania, and beyond.<sup>14</sup> Ellig and Taylor (2006) have shown that state and local taxation of wireless services creates an annual deadweight loss of \$9.6 billion, much of which could be alleviated if state and local regulatory mandates were subjected to a cost/benefit analysis.<sup>15</sup>

### III. A Cost-Benefit Analysis of Federalism with Extra-Jurisdictional Effects

As just observed, the impact of extra-jurisdictional effects on the scope for Federalism is not new to this paper. This idea is generally understood; in fact, it was incorporated into the U.S. Constitution. However, the debate over Federalism in communications policy, particularly with regard to extra-jurisdictional effects of state and local regulations, are often expressed in very general terms. In some extreme instances, the argument against state intervention relies on

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<sup>12</sup> See A. Rojas, *Phone 'Bill Of Rights' Battle Resumes*, SACRAMENTO BEE (May 6, 2007) (available at: <http://www.consumercal.org/press/battleresumes>).

<sup>13</sup> Hazlett, *supra* n. 11 at 193. Indeed, Hazlett notes, if local or regional wireless networks were more efficient, the industry had ample opportunity to emerge in that manner because the FCC has not issued national cellular and PCS licenses but instead has auctioned hundreds of regional and local licenses.

<sup>14</sup> For a discussion of this type of extra-territorial effect, *see id.* at 203-04.

<sup>15</sup> J. Ellig and J.N. Taylor, *The Consumer Costs of Wireless Taxes and Surcharges*, Mercatus Center, George Mason University (Mar. 2006) at 19-21.

accusations of incompetence or pro-regulatory ideology by state regulators. We go in the opposite direction here; the purpose of this theoretical analysis is very specific and highly favorable to regulators. The question we ask is this: in the presence of extra-jurisdictional effects from state and local regulations in the communications industry – and, in particular, the wireless segment of the industry – is it possible for independent state regulatory actions to reduce aggregate social welfare even when the independent jurisdictions make decisions that maximize their own constituent welfare? In other words, is it possible for state regulators to do “what is right” in their own jurisdictions, yet at the same time to reduce aggregate social welfare across multiple jurisdictions? If the answer is “Yes,” then it is perhaps wise to have a formal federal backstop for state interventions in industries where extra-jurisdictional effects are likely to be significant.

To answer this question, we construct a simple economic model where two independent jurisdictions faced with the decision over instituting a regulatory mandate for an industry (e.g., consumer protection or service quality rules).<sup>16</sup> To create a desire for diversity in regulatory regimes, we assume that the constituents in the two jurisdictions are not identical in that they have different preferences and needs with regard to service quality (or whatever is being regulated). For instance, one might consider one jurisdiction to have substantially more business users of wireless services and a young, well-educated population. For these reasons, this jurisdiction may favor strong mobile broadband service quality standards but be less interested in rules governing bill format. If the other jurisdiction has substantially more retirees and less employer interests, then it will be more interested in bill clarity and format than mobile broadband service quality. Even if there is no difference in the specific welfare benefit of selecting one regulatory standard over another standard, there could be a loss of social welfare if the jurisdictions fail to coordinate and select different standards.<sup>17</sup> In this case, having different standards imposes costs yet provides no benefits. We also assume that compliance with the regulatory mandates requires fixed and sunk costs but does not impact marginal cost. This last assumption renders our findings conservative, since higher marginal cost will increase prices and reduce welfare (for both consumer and producers, *ceteris paribus*).

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<sup>16</sup> Here, we are less interested in the merits of such interventions and instead assume that such mandates have positive welfare consequences within the jurisdiction.

<sup>17</sup> For example, say that two jurisdictions are considering bill format regulation and are both faced with the choice as to whether to require that bills be printed in Times New Roman font or Book Antigua. The welfare effect of either typeset inside both jurisdictions is likely to be equal. However, if the jurisdictions do not coordinate and select the same type style, service providers and overall social welfare will be harmed because implementing both standards will cost more than one standard. In this situation, coordination problems have resulted in a poor regulatory outcome.

Each jurisdiction chooses its preferred type of regulation and they make these decisions non-cooperatively. The decision regarding the type of regulation is made to maximize the sum of producer and consumer surplus in the jurisdiction (which are directly related in this case, so we are not considering price regulations).<sup>18</sup> Once the level of regulation is selected, we allow up to two firms to enter each jurisdiction. After entry, firms compete as Cournot competitors, and payoffs ensue. The relative benefits and costs of uniform or jurisdictional-specific regulatory standards are assessed by comparing these payoffs. Though the game has an entry stage, all payoffs are computed assuming duopoly competition in both jurisdictions. We note that our selection of two firms is for modeling purposes only and is not meant to imply that the wireless industry is a duopoly—in fact, according to the FCC, approximately 98% of Americans have access to at least three wireless service providers.<sup>19</sup>

#### A. Basic Setup

We assume there are two jurisdictions ( $J_1$  and  $J_2$ ), two firms (potentially) providing service ( $F_1$  and  $F_2$ ), and two types of regulation ( $A$  and  $B$ ). Moreover, the results of our model would remain the same if we modeled more jurisdictions and more service providers. With regard to the types of regulation we model, one might consider the regulation to be different mixes of service quality and consumer protection regulation, as per the example we discuss above. We assume  $J_1$  “prefers” Regulation  $A$  and  $J_2$  “prefers” Regulation  $B$  in the sense that the sum of producer and consumer surplus within each jurisdiction (i.e., jurisdictional welfare) is higher under the preferred regulation. The final test of the desirability of the regulation is based on aggregate social welfare, which is the sum of the jurisdictional welfare less the firms’ fixed and sunk costs of complying with the regulations across the jurisdictions.<sup>20</sup> We assume, sensibly, that it is more costly to comply with two regulatory standards than it is a uniform standard.

The analysis is based on a four-stage game. In Stage 1, the jurisdictions  $J_1$  and  $J_2$  choose their preferred regulatory approaches from either  $A$  or  $B$ . After this decision, in Stage 2, the two firms  $F_1$  and  $F_2$  decide which markets to enter given the regulatory choices in Stage 1. Once the firms enter (or not), they engage in Cournot competition in quantities in Stage 3. In Stage 4, payoffs accrue. As usual, we solve the game using backward induction, solving for equilibrium quantities of Cournot competition first (with duopoly in both jurisdictions).

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<sup>18</sup> We treat the regulation as increasing demand, which would increase both consumer and producer surplus.

<sup>19</sup> *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, WT Docket No. 06-17, Eleventh Report, FCC 06-142 (rel. Sep. 29, 2006) at Table 6.

<sup>20</sup> We assume that the fixed and sunk entry costs of entering a second market is zero. However, adding a small entry costs for the second market does not change character of solution, as long as this cost is not too large.

### B. *Solving for the Payoffs*

We begin by computing the equilibrium values of the Cournot competition occurring at Stage 3. Recall that  $J_1$  prefers regulatory regime  $A$ , and  $J_2$  prefers regulation regime  $B$ , and this preference arises from consumer demand. This preference is captured by the demand curves for the service. Let the demand curve for the relevant service in  $J_1$  be

$$q = 1 - p \quad \text{if Regulation } A \text{ adopted;} \quad (1a)$$

$$q = \gamma - p \quad \text{if Regulation } B \text{ adopted;} \quad (1b)$$

where  $0 \leq \gamma \leq 1$  and  $\gamma$  measures the jurisdictional preference in demand for the preferred regulation. Since  $\gamma$  is less than or equal to 1, Regulation  $A$  is always as good or preferred to Regulation  $B$  in  $J_1$ . We assume the two jurisdictions are symmetric.<sup>21</sup> Thus, in  $J_2$ , which prefers Regulation  $B$ , we have the demand curve  $[q = 1 - p]$  if Regulation  $B$  is adopted and  $[q = \gamma - p]$  if Regulation  $A$  is adopted.

Assuming zero marginal cost to providing service and Cournot competition among duopolists, we can compute the equilibrium values of quantities, price, profits and consumer surplus. Table 1 summarizes these equilibrium values under cases of a Good Match of regulation ( $J_1$  chooses  $A$ ,  $J_2$  chooses  $B$ ) and a Bad Match of regulation ( $J_1$  chooses  $B$ ,  $J_2$  chooses  $A$ ). In the table, consumer surplus is summed across both markets ( $CS^*$ ) and the sum of profits consists of four parts (2 firms, 2 jurisdictions). Importantly, profit in these payoffs does not include the fixed and sunk costs of complying with the regulations.

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<sup>21</sup> Because the jurisdictions are symmetric, the results do not depend on one market being larger or smaller than the other.

Table 1. Equilibrium Values (Duopoly)		
	Good Match ( $J_1, A$ ) ( $J_2, B$ )	Bad Match ( $J_1, B$ ) ( $J_2, A$ )
$q_i^*$ =	1/3	$\gamma/3$
$\sum q_i^*$ =	2/3	$2\gamma/3$
$p^*$ =	1/3	$\gamma/3$
$\pi_i^*$ =	1/9	$\gamma^2/9$
$CS^* = \sum \pi_i^*$ =	2/9	$2\gamma^2/9$

Note that if there is no preference for technology ( $\gamma = 1$ ), then the equilibrium values are identical across the Good and Bad Match (since, in essence, there is no good or bad match). Otherwise, all equilibrium values are lower under a bad match (since  $\gamma < 1$ ). Therefore, the constituents (firms and consumers) in each jurisdiction prefer a Good Match; consequently, so does the regulator.

### C. Payoffs

We now evaluate the payoffs to determine whether the independent decisions made by jurisdictions can conflict with social welfare. Importantly, we calculate all payoffs assuming duopoly in both markets. While it is possible that other market structures could result from the choice of regulation (either monopoly or no entry in either or both jurisdictions due to higher costs), we limit our attention to cases where there is no change in the competitive market structure. Generally, state regulators do not view their interventions as sufficiently costly to deter entry, so this approach adds to the policy relevance of our analysis. A reduction in competition will reduce jurisdictional welfare, biasing the analysis in favor of a uniform standard.<sup>22</sup> Thus, our approach is conservative.

First, we consider the payoffs when  $J_1$  picks Regulation A and  $J_2$  picks Regulation B. Since these are the preferred levels of regulation in each jurisdiction, this is the Good Match case. Again, we assume that both firms enter both markets. Across both jurisdictions and for all firms, with a Good Match we have (from Table 1 above)

<sup>22</sup> See, e.g., G.S. Ford, T.M. Koutsky and L.J. Spiwak, *Competition After Unbundling: Entry, Industry Structure and Convergence*, 59 FED. COMM. L.J. 331 (2007); G.S. Ford, T.M. Koutsky and L.J. Spiwak, *Wireless Net Neutrality: From Carterfone to Cable Boxes*, PHOENIX CENTER POLICY BULLETIN NO. 17 (Apr. 2007) (available at: <http://www.phoenix-center.org/PolicyBulletin/PCPB17Final.pdf>).

$$\sum CS^* = \frac{2}{9} + \frac{2}{9} = \frac{4}{9}; \quad (2)$$

$$\sum \pi_i^* = \frac{2}{9} + \frac{2}{9} = \frac{4}{9}. \quad (3)$$

These values are two of the three components of *aggregate social welfare* (SWF), the third being the fixed and sunk costs of compliance with the regulatory standards. Call these costs  $C(A,B)$  for each firm if both Regulations A and B are implemented. If only Regulation A was required in all jurisdictions, then the costs are  $C(A)$ , and likewise for B. Social welfare (SWF), then, is

$$SWF = \frac{4}{9} + \frac{4}{9} - 2 \cdot C(A,B). \quad (4)$$

Second, we consider a uniform standard across the jurisdictions. In this case, one of the two jurisdictions does not get its preferred regulatory regime. Assuming that a “national” regulator imposes Regulation A as the uniform level of regulation in both  $J_1$  and  $J_2$ , aggregate social welfare is<sup>23</sup>

$$SWF = \frac{4}{9} + \frac{4\gamma^2}{9} - 2 \cdot C(A). \quad (5)$$

If  $\gamma < 1$ , then the sum of jurisdictional welfare (the first two terms) is lower in the case of a uniform standard, but aggregate social welfare is not necessarily lower since the fixed and sunk costs of compliance are lower [ $C(A) < C(A,B)$  by assumption]. Further, the difference between the two expressions depends on the size of  $\gamma$ . There are other possible outcomes (such as a Bad Match), but these two cases are the ones we are most interested in.

#### D. Cost Benefit Analysis

From above we learned that the sum of jurisdictional welfare is lower under a uniform standard, but the whether or not aggregate social welfare was lower or higher depended on the compliance costs. From Expressions (4) and (5) above we see that a uniform regulatory standard is superior in an aggregate social welfare sense to different standards if and only if

$$[C(A,B) - C(A)] > \frac{2}{9}(1 - \gamma^2). \quad (6)$$

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<sup>23</sup> It is also possible for the uniform method of regulation to be selected as B. If so, then the results are symmetric to this case, so we ignore this alternative.

Intuitively, Expression (6) simply states that a uniform standard is superior if the additional costs of complying with two rather than one regulatory standard exceed the additional jurisdictional surplus provided by the better matched technology.<sup>24</sup> Expression (6) reflects a simple cost-benefit test—what are the benefits of better matched regulatory standards and do they exceed the fixed and sunk costs of complying with those standards? Note that if there is no preference across jurisdictions for a regulatory standard ( $\gamma = 1$ ), then obviously the condition in Expression (6) passes since the right-hand side is zero [ $1 - 1^2 = 0$ ]. Thus, the smaller the gain in surplus (either consumer or producer) of the technology, the less likely the condition is satisfied (costs constant). In some cases, there may be multiple regulatory standards available, none of which is preferred to another. Yet, if jurisdictions cannot coordinate their decisions, then multiple standards may be chosen, thereby leading to an inefficient outcome (there are costs but no benefits). We stated above that we computed the payoffs based on a duopoly market structure. Thus, we must determine whether or not it is possible for Expression (6) to hold yet the jurisdictions remain competitive. A second entrant will enter the mismatched market ( $J_2$ ) if and only if

$$[C(A,B) - C(A)] < \frac{1}{9}. \quad (7)$$

The left-hand side of Expression (7) is the same as Expression (6), and we know that the right hand side of Expression (6) lies between 0 and  $2/9$  (given the ranges of  $\gamma$ ). Thus, it is possible for Expression (6) and (7) to simultaneously hold. We conclude that duopoly can be viable with two regulatory regimes in a situation where a uniform standard is preferred. Of course, this result does not imply that defection from a uniform standard will result in a more concentrated market structure. If regulations keep some firms out (e.g., create monopoly or end markets altogether), then jurisdictional welfare is lower than we take it to be here and the uniform standard is more likely to be optimal.

#### E. *Nash Equilibrium in Choice of Regulatory Approach*

We have shown that under some conditions (not always), a uniform standard is preferred in the presence of extra-jurisdictional effects. The next obvious question is whether or not the local regulators can be trusted to pick the aggregate social welfare maximizing level of regulation. The answer is “No.” Table 2 illustrates the payoff matrix for the regulators. In the table, the upper left is payoff to  $J_1$ , lower right payoff to  $J_2$ . As before, payoffs assume duopoly in both markets. For  $J_1$ , choosing Regulation A is a dominant strategy—the payoff for choosing A of  $2/9$

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<sup>24</sup> We assume that the incremental cost to a firm of adding another standard is positive, large enough, but not too large. If the incremental cost is too large, then market structure is affected by regulatory choices.

is always at least as big as the payoff of *B* which is  $2\gamma^2/9$ . Likewise, for  $J_2$ , choosing Regulation *B* is a dominant strategy. Thus, the regulators choose their own preferred regulatory regime. Thus, there is a sort of prisoner’s dilemma here: The dominant strategies of both jurisdictions do not necessarily render the social welfare maximizing result (though they do maximize jurisdictional welfare).

**Table 2. Payoff Matrix**

		$J_2$	
		A	B
$J_1$	A	4/9  $4\gamma^2/9$	4/9  $4/9$
	B	$4\gamma^2/9$  $4\gamma^2/9$	$4\gamma^2/9$  $4/9$

Payoff  $J_1$ , Top Left; Payoff  $J_2$ , Bottom Right.

In effect, a jurisdictional surplus maximizing regulator always picks his preferred standard (a Good Match) since  $0 \leq \gamma \leq 1$ . Thus, in cases where a uniform standard is socially optimal, the jurisdictions will not make the welfare maximizing choice of regulation from an aggregate welfare perspective. This fact is not a criticism of the regulator—the regulator here chooses to maximize the welfare of its jurisdiction. The regulator in  $J_1$ , however, cannot control the decision in  $J_2$ , and as a consequence cannot control compliance costs. This lack of control (and coordination) is the source of the problem.

**IV. Conclusion**

The purpose of the theoretical analysis in this BULLETIN is very specific, and by no means do we attempt to create a general theory of Federalism. In the end, questions about the division of authority between federal, state and local governments are complex cost/benefit analyses that involve a multitude of factors.

While our efforts are limited, we do answer an important question: In the presence of extra-jurisdictional effects, is it possible for independent state regulatory actions to reduce aggregate social welfare even when the independent jurisdictions make decisions that maximize their own constituent welfare? In other words, is it possible for state regulators to do “what is right” for their own constituents, yet at the same time to reduce social welfare? The answer to that question is “Yes.” Our analysis does not imply that all independent state actions are welfare-reducing when extra-jurisdictional effects or spillovers are present, but we do observe that when those effects or spillovers are particularly large, a national solution or standard is generally preferable. Accordingly, because extra-jurisdictional effects in wireless

communications are likely to be present and in many cases significant, the regulation of wireless communications services, to the extent there is any, should have a national bias.

Some general policy guidelines are suggested by our analysis. First, one typical way of incorporating state and local authority into federal regulatory regimes is to establish a federal “floor” and permit state and local authorities to adopt additional, heightened regulation that is tailored to local conditions. This model of “cooperative federalism” has been utilized in some areas of environmental and communications law and has been proposed for wireless services. However, our model demonstrates that this approach presents a significant risk of a decrease in social welfare in an industry characterized by large extra-jurisdictional effects and spillovers even if state and local governments regulate in the interests of their own constituencies.

Second, our analysis suggests that there should be some formal accounting, even if crude, of the likely benefits and costs of deviating from a uniform, national standard to jurisdiction-specific regulation. The administrative costs of complying with seemingly trivial interventions can be sizeable, and we show here that such costs may not be considered in a decentralized regulatory regime.

Mobile wireless services are not offered in a vacuum, and they are complementary to a number of advanced communications technologies and services both within and across regulatory boundaries. Regulation of a single aspect of service in one geographic area can have effects well beyond the borders of the regulating state or municipality. Such costs should be quantified and compared to alleged benefits. As shown in this BULLETIN, however, because state and local regulation in the wireless industry has the tendency to spill across borders, our analysis suggests that society is likely better off with a single, national regulatory framework for wireless services.

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