## Regulatory Federalism in Network Industries<sup>\*</sup>

Francesc Trillas<sup>†</sup>

#### Abstract

This article starts by surveying the literature on economic federalism and relating it to network industries. Some new developments are then added and used to analyze the determinants of specific investments and the interaction between structural and behavioral regulation. Central or federal policy making is more focused and especialized and makes it more difficult for interest groups to organize. Under some conditions, however, central powers will be associated with more underinvestment than local powers. The latter may use other policy objectives as a commitment device. When technology allows the introduction of competition in some segments, the possibilities for organizing the institutional architecture of regulation expand. Liberalization will typically require institutional cooperation, but cooperation has costs and may be inhibited by distributional concerns.

#### 1 Introduction

The allocation of regulatory tasks in network industries across the vertical structure of government has become a salient issue both in Europe and the US in the recent past. In the European Union, the new regulatory packages that are being debated include the creation of some form of pan-European telecommunications and energy regulators. At

<sup>\*</sup>This research started when the author was a Visiting Scholar at UC Berkeley, under a BE grant from Generalitat de Catalunya. The research is also part of a project funded by Fundación Repsol. I thank Richard Gilbert, Patrick Mason, Daniel Rubinfeld, Pablo Spiller, Catherine Wolfram, and Glenn Woroch for helpful discussions.

<sup>&</sup>lt;sup>†</sup>Universitat Autònoma de Barcelona. Francesc.Trillas@uab.cat. Departament d'Economia i Història Econòmica, Campus de Bellaterra, UAB, Bellaterra (Barcelona), SPAIN. Tel.: +34-935811717.

the same time, jurisdictional conflicts have intensified, for example in the discussion about the regulatory holidays for next generation broadband between Germany and the European Commission, or the jurisdictional controversy about the conditions for the failed takeover of Endesa by E-On between Spain and the European Commission. In the United States, the 1996 Telecommunications Act and technological developments such as the expansion of Internet and wireless telephony have blurred the traditional distinction between interstate and intrastate issues, and (to use the words of a recent overview of US telecommunications<sup>1</sup>) have marked the transition between an era of dual ("bright lines") federalism (where there was a clear distinction between the role of the states and the role of the FCC, the federal regulatory agency) to a more complex era of cooperative federalism (where the states and the FCC are jointly responsible for a number of tasks). In electricity, the Federal Energy Regulatory Commission tries to promote the creation of Regional Transmission Organizations that preside over the expansion of wholesale markets and coordinate the transmission of electricity over these markets, and more often than not the states resist such process. Additionally, federal and state agencies have overlapping or concurrent jurisdiction in energy merger cases; state agencies often invoke ill-defined "public interest" objectives that give them discretion to stop potentially efficiency-enhancing mergers (Wolak, 2007).

There is a well documented historical trend by which the regulation of utilities has moved up in the vertical chain of government, starting at the begining of the XXth century from the local to the state level in the US<sup>2</sup> and other jurisdictions.<sup>3</sup> However, in the US the bulk of regulation is still performed at the state level and has not moved much further up to the federal level, although the federal regulatory agencies created in the New Deal era have played an increasing role first regulating interstate issues and in the recent past promoting and actively overseeing liberalization. Meanwhile, significant intervention still persists at the local level, as illustrated by the role of municipal ownership of distribution utilities in the US (more than 100 US cities have a municipal utility) or Norway, or in the initiatives of local powers to promote broadband access to the Internet in many localities.

Decentralized powers are under significant pressure to intervene in regulated network industries, at least for three reasons (see Troesken,

<sup>&</sup>lt;sup>1</sup>Nuechterlein and Weiser (2006).

<sup>&</sup>lt;sup>2</sup>See Troesken (1996).

<sup>&</sup>lt;sup>3</sup>Although in most other jurisdictions, the move to the national-state level involved the creation of state owned and (moslty, although not universally, especially in electricity) national vertically integrated firms.

#### 1996):

(i) the physical deployment of networks depends on the rights of way for which local powers are often naturally responsible;

(ii) regulatory policies are locally salient, and

(iii) interest groups find it relatively easy at the local level to organize to influence these policies in a variety of directions.

If local powers were responsible for most of these policies (for example, for setting regulated tariffs) they would face the typical commitment problem in the presence of sunk investments (see for example Levine et al., 2005 and references therein). For reasons that will be explained in Section 3, local powers have a number of objectives when deciding to intervene in regulated industries. Central policies tend to be more focused than local policies, in the sense that they are subject to the influence of a lower number of interest groups and can afford to incur the costs of regulatory specialization, but may create too much homogeneity, and they are also subject to commitment issues. A key question then is how to organize regulation taking into account the constraints faced at each level of government.

Liberalization processes in the US and the EU add a further layer of complexity relative to monopoly regulation. As some authors have characterized the liberalization process in network industries as a "long and winding road,"<sup>4</sup> no minor ingredient of such conditions is the relationship between the different government levels. If anything, the introduction of competition increases institutional diversity (see Moore, 2002), for example in electricity by introducing the role of system and market operators (which can be integrated in the same organization or not, and this organization can be integrated with a transmission company or not). Although the federal levels at both the US and the EU have promoted liberalization of competitive segments in different forms, there has been more variation in the extent to which US states or EU member-states have embraced the liberalization of electricity or telecommunications.

The organization of government may not always coincide with market boundaries or with the boundaries of firms. As Woroch (1990) argues, "when multiple regulators are unavoidable, boundaries between them should divide areas and services that exhibit low cross-elasticities of demand and supply. Such "bright lines" have become less attainable with recent developments in telephony." And "how governments divide up the industrial landscape may be vastly different from how business choose to organize." In telecommunications and electricity, there are substantial differences in the interaction between competitive potential and geographical scope. Distribution and supply are local goods in electric-

<sup>&</sup>lt;sup>4</sup>Armstrong and Sappington (2006).

ity and transmission and generation are regional in scope; transmission and distribution are regulated natural monopolies of different geographic scope. An important difference with telecommunications is that long distance communications are also supra-local but are potentially competitive. The following table summarizes the characterization of the electricity industry:

	Competitive Segment	Monopolistic Segment
Local Scope	Supply	Distribution
Regional Scope	Generation	Transmission

In some aspects of the economic analysis of regulatory institutions, sometimes regulation has been compared to monetary policy. For example, it has been suggested that the rationale for regulatory independence is similar (although not identical) to the rationale for Central Bank independence (see Levine et al., 2005). It would thus be tempting to suggest that both in the US and the EU the solution for the jurisdictional allocation of regulation should imitate the solution for monetary policy: allocate it to a federal agency. However, the jurisdictional allocation problem in regulation is vastly complicated by the vertical industrial structure of network industries, where different industry segments could operate at different optimal geographical sizes.

The relationship between regulation and investment is another key aspect of the debate. For example some commentators argue that too much regulatory diversity discourages investment because it introduces costs related to red tape and uncertainty.<sup>5</sup> But others (such as Weingast and his co-authors in their theory of market preserving federalism reviewed in Section 2) argue that decentralization introduces a variety of veto points which stop the predatory tendencies associated to Leviathan and restricts the information and authority available to central powers, thereby contributing to reinforce commitment (not to expropriate investments). But decentralization as an attempt to reduce the role of state intervention (as advocated in the Reagan era) may have the problem of reducing the scope for good as well as for bad policies: as it is well known in the literature on reform in developing countries, the further veto points contributed by decentralization favor the status quo: this may be good if the status quo implies preserving the value of investments, but it may be bad if the status quo implies stopping a potentially welfare increasing market expansion or liberalization process. Both the

 $<sup>^{5}</sup>$ On the costs of overlapping or duplicated regulation, see mentions to it by Kovacic (2007) and Spector (2007).

new political economy of federalism and the experience of US electricity suggest that decentralization (at the state or member state level) is better at providing commitment for investment than at accommodating market reforms.

There are not many academic contributions in economics to the federalism debate in the field of the regulation of network industries<sup>6</sup> (although there are generic references to "regulation" in the federalism literature, such as in Oates, 1999 and Easterbrook, 1983), as compared to the literature on fiscal or environmental policy. There are some informal discussions (Smith, 2000; Brennan, 2003; Seabright, 1998), some empirical work (Humplick and Estache, 1995), a few very general theoretical models that can be applied to any industry or policy (Seabright, 1996; Caillaud et al., 1996), and very few models applied to network industries (Laffont and Pouyet, 1994; Bardhan and Mookherjee, 2006; Woroch, 1990; and Lehman and Weismann, 2000).

Existing theories or empirical work on economic federalism, which are reviewed in the next Section, do not allow for a general conclusion in favour of a clear assignment of centralized or decentralized regulation, and the solutions may be country or sector specific. However, decisions on jurisdictional allocation of regulatory responsibilities are a matter of discussion both in the EU and in the US, and they would benefit from old and new considerations on economic federalism.

As an example, the National Regulatory Research Institute (NRRI)<sup>7</sup> in the US suggests federalism principles that might underlie a potential new federal Telecommunications Act in the US. These may include:

a. State participation is desirable whenever a sound regulatory decision requires knowledge of local conditions, such as the locations for areas not served by rural broadband.

b. State participation is desirable when controversies are so numerous or time consuming as to be beyond the resources of the FCC. State commissions have, in the aggregate, far more fact-finding resources than the FCC.

c. State financial participation is desirable whenever it would advance a costly federal objective. For example, the courts and the Universal Service Joint Board have recognized the advantages of a state-federal partnership in universal service.

d. State enforcement of existing federal or state standards is desirable

<sup>&</sup>lt;sup>6</sup>There are interesting contributions to federalism in network industries from historians (Troesken, 1996), legal scholars (Weiser, 2001 and 2003) and political scientists (Teske, 2004).

<sup>&</sup>lt;sup>7</sup>This is the research arm of the National Association of Regulatory Utility Commissioners (NARUC). See http://nrri.org.

whenever it produces better results for retail or wholesale consumers. States are often the first point of contact for consumer complaints, and states ordinarily offer quicker and more effective responses to consumer complaints.

e. States are better able to respond to new problems where a single national policy would be premature. Early state actions regarding slamming and telephone number pooling, for example, guided subsequent FCC policies.

"Laboratory federalism" in case of uncertainty is one of the most convincing arguments in favour of decentralization in network industries such as telecommunications and electricity where even expert economists disagree on what the exact attributes of reform should be. Joskow (2006) argues as follows on the comparison between California and other states in electricity: "Interestingly, the New England states, New York, New Jersey and Pennsylvania had implemented very similar reforms at about the same time and experienced some of the same exogenous shocks to demand and fuel prices in 2000 and 2001. Yet they did not experience the same system meltdown as did California. So, there is something to learn as well comparing some of the more detailed aspects of the reforms in California with those in these other US states." However Joskow doubts that the right lessons have been learned from California, probably suggesting that the crisis was seen as an indictment of liberalization instead of as a guide to which mistakes should be avoided when restructuring electricity.

This article explores first to what extent the existing literature on economic (mainly fiscal) federalism is applicable to network industries. The conclusion of this exploration in Section 2 is that many of these insights can be readily applied to these industries, but that some additions to the existing theory may shed further light on this jurisdictional allocation problem. One of these additions is related to the conflicts of policies (for example between "industrial policy" and the control of market power) that pervade decision-making especially in decentralized administrations. A basic model is then introduced in Section 3 that captures this additional insight. The second addition, introduced in Section 4, concerns the relationship between central and local powers in developing structure regulation (in addition to behavioral regulation). In network industries, it is common that different levels of government have responsibilities in structural or behavioral regulation over different phases of the value chain. Section 5 concludes and discusses limitations and ideas for future research.

## 2 The Regulation of Network Industries and the Literature on Economic Federalism

The theoretical and empirical literature on economic federalism<sup>8</sup> provides few clear cut prescriptions as to the appropriate jurisdictional location of regulatory decisions, although it contributes a variety of insights that may be useful in specific settings. In general, centralization performs better when there are jurisdictional spillovers and when there are coordination issues and product and "policy" economies of scale. Centralized decision making does not necessarily imply uniform decision making (as in electricity in the UK -except Northern Ireland), so in theory it can deal with heterogeneity, which in the absence of differentiated central policies would favour decentralization. Decentralization is also favoured when knowledge of local demand or cost (including political transaction costs) conditions is important. Moreover, the type of decentralization is often crucial in the arguments. Not surprisingly, the empirical evidence finds little overall significant evidence of decentralization dominating centralization or vice versa. Further details on the literature are given below, but the focus here is on how the arguments affect the regulation and other public policies related to network industries. The discussion is organized by starting with the traditional, "first generation" fiscal federalism studies, and next analyzing issues addressed by "second generation" studies, concerned by agency (informational assymmetries and accountability) and capture issues.

#### First generation fiscal federalism: regulatory competition, heterogeneity, scale and laboratory federalism

"Laboratory federalism" is the concept used to portray the situation where a number of decentralized jurisdictions experience with different options to solve the same problem in the face of uncertainty, so that all the decentralized units can learn, in an idea originally attributed to Justice Brandeis<sup>9</sup> of the US Supreme Court. To some extent, this is what has happened with regulatory reform in the recent past: some jurisdictions have learned from others' experiences. For example, the California crisis in 2000 has influenced subsequent developments in US electricity, or the functional separation of the incumbent's wireline telecommunications broadband network in the UK has been taken as an example by the European Commission to promote (so far without much success) a

<sup>&</sup>lt;sup>8</sup>For excellent surveys of the general literature on federalism, see Oates (1999) and Treisman (2007). Several definitions of federalism are provided by Riker (1964), Rubinfeld (1997), and Treisman (2007).

<sup>&</sup>lt;sup>9</sup>Although Justice Brandeis of the US Supreme Court is usually credited with coming up with the idea of laboratory federalism in the 1930's, Oates (1999) cites Lord James Bryce as an earlier reference in 1888.

similar model in the rest of the EU. In a decentralized federation where jurisdictions spontaneously engage in innovation, there will be too few innovations because of the public good nature of uncertainty reducing information.<sup>10</sup> Of course, the federal level and the states can derive the wrong lessons from experiments: the interested parties will highlight those elements of the experiences that best suit their interests. As in any decicion making public policy process, the outcome will depend on a number of political economy dimensions.

Competition between states to attract mobile factors may select good policies in equilibrium under some conditions; for example, competition between jurisdictions becomes less effective as the size of the legislating jurisdiction increases.<sup>11</sup> The classical Tiebout (1959) model of fiscal competition is a revelation mechanism exercise where citizens reveal their preferences for local public goods by moving around localities that offer different combinations of taxation and public goods. Easterbrook (1983) translates the argument to general regulatory policies and concludes that "one need not think of states as laboratories, as Justice Brandeis did, to know that the pressures of exit and voice cause governments to search for laws that strike an adequate balance between favors to interest groups and benefits to other residents. The greatest threat to consumers' welfare is not states, and their competition, but a uniform national regimen that stifles the power of exit -that is, a monopoly of lawmaking." However, conditions for inter-jurisdictional competition being efficient are strong.<sup>12</sup>

In most network industries, capital is fixed and sunk and therefore immobile. Hence the argument that capital mobility induces good regulatory policies cannot be made in the sense that the regulated industries' capital will not move as a result of bad policies. But in theory it can still be made in the indirect sense that other business (not in the regulated sector, but who use an input from a regulated industry) and individuals can move as a result of an environment of bad performance of the regulated sector caused by inefficient regulation. Inter-jurisdictional compe-

<sup>&</sup>lt;sup>10</sup>The degree of innovation contributed by the decentralized units will be lower than optimal because they pay the full costs of the innovative activities and will only reap part of the benefits. It would be better then to centrally organize the localized experiments.

<sup>&</sup>lt;sup>11</sup>Casual empiricism reveals that it is precisely in large countries where sub-central units are large (US, Canada, Australia, Argentina, India) that regulation is decentralized (see also Beato and Laffont, 2002). This suggests that the jurisdictional competition rationale has not played an important role in the evolution of regulation in these countries.

 $<sup>^{12}</sup>$ Spector (2007) cites negative recent empirical results for the states competition theory based on the Tiebout model.

tition for mobile capital may however only favour initially rich regions if the initial heterogeneity is too high (see Treisman, 2007). If capital is more mobile than labour, and competiton for capital takes place at least in part through low taxes, this may go to the detriment of services toward less mobile factors ("race to the bottom"), and if it is accompanied by lower regulatory standards in fields with negative externalities, it may unleash again a race to the bottom in the form of "beggar thy neighbour" policies. In regulation, as argued by Woroch (1990) for US telecommunications, "in their desire to attract new businesses and new citizens, regulators will comptete with one another in terms of their policies. States could impose high access charges for interstate calls terminating in their state while showing favour to outgoing calls or intrastate traffic. This tendency could lead to beggar-thy-neighbor policies which can evolve into inefficient outcomes for all jurisdictions."

In vertical competition models (Treisman, 2007, ch. 6), different government layers taxing the same base yields "overgrazing": too high taxation and lower output than under one tax (in a similar argument to double marginalization in Industrial Organization). Equivalently, two tiers providing complementary infrastructure investments may provide too little if they do not cooperate. However, cooperation is difficult to enforce in all relevant dimensions, and if it is achieved in one dimension but not in others, cheating may go in the non-cooperative dimensions. Under lack of cooperation, increasing the revenues that accrue to the local powers may decrease its appettite for expropriation, but increase the predatory instincts of the central layer.

Inman and Rubinfeld (1997a,b) and Oates (1999, 2006) note that the conditions of the Tiebout model are not necessary for decentralization being superior to centralization. In his Decentralization Theorem, Oates establishes that if the benefits of accounting for heterogeneity outweigh the problems created by jurisdictional externalities and lack of scale, decentralization is a superior option. The optimal scale must take into account the costs of providing the service, the administrative costs of regulation and the communication costs between all the agents involved (see Treisman, 2007). The fixed administrative costs of regulation make it more likely that specialized regulatory functions will be developed the larger the population involved (see Mulligan and Shleifer, 2005). It can be argued that to achieve policy differentiation and taylor the size of projects to total costs and benefits, political decentralization is not needed, and local units of a central state can provide the local projects absent communication problems. However, even in the absence of these problems, political decentralization (locally chosen decision units) may act as a commitment device for the robustness of decentralization, as argued by Inman (2008). Treisman (2006) finds that political federalism is positively correlated with the proportion of decentralized over total country revenues or expenditures.

Oates (2002) distinguishes three different settings in environmental regulation that call for different organizations in the vertical structure of government:

-Pure public goods, where the impact on any jurisdiction depends on the sum of local productions; examples being global warming, research.

-Local public goods with no spillovers, where the impact on any jurisdiction depends on local production; the clearest example being garbage collection.

-Local public goods with spillovers, where public goods in one jurisdiction have some effect on neighbouring jurisdictions, the clearest example being environmental policies.

Pure public goods call for central responsibilities (although political feasibility and local information may make necessary some decentralized intervention, as in the European Trading System of polluting permits); local public goods call for decentralized intervention (although with capital mobility, if the "race to the bottom" is a reality, then uniform standards, which may be better established with some sort of central intervention, may be necessary; however, there is no race to the bottom under some circumstances, such as no constraints on the existence of instruments). In all these three cases, global uncertainty may make the flexibility of laboratory federalism valuable ("the states as a laboratory of democracy").

Klevorick (1996) includes competition policy as example of the sort of standards that some claim that may be necessary to establish uniformly if the race to the botom occurs. The author however claims that the arguments both for the existence of such race and, even if it exists, the necessity of uniform standards, are not overwhelmingly convincing. In regulated industries, there is a potential role for centralized, even international powers in the setting of technical standards (see Gruber, 2004, on cellular telephony). A popular application of the "common standards" rationale is the argument that too many policies increase costs and uncertainty, thwarting investment.

Even when common policies that internalize spillovers are preferable, local units may cooperate on policies that maximize their joint payoff, without the need for a central power. Coasian cooperation of sub-central jurisdictions (making central jurisdictions unnecessary) is however possible only in very specific circumstances, as argued by Inman and Rubinfeld (1997a). Special districts in the sense of Frey and his co-authors can be interpreted as a version of Coasian cooperation, where specific agencies of different (optimal) sizes to deal with individual services are proposed, as opposed to all purpose institutions.<sup>13</sup> The scale and specialization advantages of such institutions should be weighed against the problems related to the duplication of fixed costs, the interdependencies between different policies and the difficulties and costs of sustaining cooperation.

There is often the need to play complementary roles between the central and the local levels, for example the central level deciding on criteria or objectives and the local level being delegated the task of implementing the central guidelines and filling in the voids when the central prescriptions leave some issues open. This has been called *cooperative federalism* by some authors.<sup>14</sup>

# Second generation studies: Information, commitment and transaction costs

Arguments related to information can also go either way, depending on the type of information. Economies of scale in expertise favor central policy allocation, but proximity to local conditions coupled to communication costs favor decentralized policy making. Exchange of information may be useful for purposes of yardstick competition, eg across disjoint similar jurisdictions in charge of regulating electricity distribution. Or there may be huge product market externalities as in electricity transmission which justify centralized regulation but still the informational (and political, for example to overcome resistance to investments) input of the local level be useful. The central regulator transferring his better information (due to scale economies in expertise) to the local ones, or the other way around (due to proximity lo local conditions) emerge a priori as sound cooperation strategies. There may be no externalities in the product market but still there may be informational externalities, as in the Laffont and Pouyet  $(2004)^{15}$  model. Location of expertise and good information are key issues in modern regulation, both in the practice and

 $<sup>^{13}</sup>$ See Eichenberger and Frey (2006) and Casella and Frey (1992). Examples of special districts of different sizes include citizen communities in Swiss cantons to manage electricity distribution; metropolitan transport authorities; organizations in Spain to manage water use and irrigation; regional electricity transmission organizations combined with wholesale power markets such as PJM in the U.S.; or large international organizations to deal with specific issues such as NATO.

<sup>&</sup>lt;sup>14</sup>See Stalon and Lock (1990) in energy and Nuechterlein and Weiser (2006) in telecommunications.

<sup>&</sup>lt;sup>15</sup>This paper presents a brief, but useful, review of contract theory models related to decentralization issues. Baron (1985) presents an incomplete information model where a federal environmental agency may or may not cooperate with a state product regulation commission. The output is produced in a particular state but production involves pollutants that affect other states. Efficiency can only be achieved by cooperation, but this may be inhibited by distributional considerations.

the theory of it. Aubert and Laffont (2002) argue that (p. 20): "...This type of thinking favors decentralization when local information is good and explains the trend toward local decisionmaking for managing natural resources, such as water and forests. On the other hand, for health and specific environmental issues, local information may be weaker than that of the central government, which has better access to international information." In the US and the EU, the staff and other resources of state or member state commissions vary widely, and in general it is very doubtful that that they can perform analyses of the same caliber as the federal agencies.

Analogies can and have been made between federalism and the role of decentralization in the theory of the firm and the market (see Hayek, 1948) and trends in firm models in the real world. Bigness at the central level introduces costs of planning in a similar way that there are costs of managing large companies (see Mookherjee, 2006). However, decentralization may inefficiently duplicate some fixed costs of regulation. Better information at the local level may allow for better design of incentive mechanisms at this level (see Tommasi and Weischelbaum, 2007). Oates (1999, p.1137) argues that "the vertical structure of government may have important implications for the way in which the public sector functions and its impact on the operation of a system of markets." Decentralization can be a way to delegate and avoid overload, as it was argued for example in the reform of European merger policy. Caillaud et al. (1996) present an interesting model where there is delegation, but still the central powers influence the bargaining relationship of better informed local regulators with firms by using transfers.

The analogy with the theory of the firm is also used by the proponents (Weingast and his co-authors) of "market preserving federalism": a commitment not to concentrate authority and information may play a similar role as commiting not to fall in a ratchet effect in agency theory. Proponents of "market preserving federalism"<sup>16</sup> argue (in a rather informal way) that under some conditions (decentralized "primary" regulatory responsibility; a single market for the whole federation; centralized monetary policy and absence of central bail-outs) a decentralized system preserves the growth of a market economy. Rodden and Rose-Ackerman (1997) argue that the conditions stated by Weingast and his co-authors, which certainly would make federalism preserve markets, are very unlikely to be self-enforcing or even mutually compatible; for example, it is difficult that decentralization would avoid exacerbating inequalities, compromising the political sustainability of the compact, and it is diffi-

 $<sup>^{16}\</sup>mathrm{Rodden}$  and Rose-Ackerman (1997) and Rubinfeld (1997) place this theory in the framework of the New Institutional Economics.

cult that a central state without relevant economic policy levers would be able to police a common market and avoid local protectionism.

More information is not always beneficial in dynamic settings, absent regulatory commitment. Qian and Weingast (1997) argue that reducing the information available to central powers reduces the temptation they have to expropriate investments. But Spector (2007) suggests that in some cases (indirect taxation in the EU) the local (national) powers may prefer to strategically delegate to central powers to avoid political criticism. For example, in the relationship between decentralization and macroeconomic management or reform, federalist structures create veto points that provide committment, but also stall welfare-enhancing reforms (Rodden and Wibels, 2002). The order of reforms should then be: first reform at the national level, then decentralize to provide commitment (Treisman 2000).

Troesken (1996),<sup>17</sup> in a detailed account of the history of the gas industry regulation in the city of Chicago (with some references also to the history of other US cities), argues that the move from local franchises to state regulation, which took place in the US under lobbying by regulated firms in the first decades of the XX Century, was rooted in the inability of local politicians to commit not to expropriate sunk investments. Local franchises evolved into a system of politicized and arbitrary local regulation after technological change triggered by the use of water gas caused the entry of new firms in the gas industry and a subsequent process of deregulated consolidation. State institutions would be more able to commit<sup>18</sup> than local institutions because the ability of consumers to organize and exert political pressure ex post at the state level is relatively lower.

Troesken (1996, p. 89) reports that the vice president of the Pacific Gas and Electric Company argued that under municipal regulation, corporations were "at the mercy of as pitiless a pack of howling destroyers, as would the lonely traveller on the Sibberian steppes be against the gaunt and hungry wolves." The company vice president advocated state regulation, in part, because state commissions would set rates in "calm deliberation and not in political heat."

#### Second generation studies: Capture and accountability

Easterbrook (1983) dismisses the idea that capture at the state level is higher than at the federal level, as often suggested. He argues (footnote 52) that "it would be easier for interest groups to obtain protective

<sup>&</sup>lt;sup>17</sup>I thank Pablo Spiller for calling my attention for this important reference.

<sup>&</sup>lt;sup>18</sup>The higher profits of firms under state regulation than firms without state regulation found by Stigler and Friedland (1962) would then be evidence of state regulation yielding higher profits than local regulation, but not higher profits than deregulation.

legislation from states, because the coalitions needed to support the laws would be smaller. But because the detriments of the legislation would fall on a more concentrated group, and because it is easier to move away from local governments than from the United States, it is difficult to know whether interest groups in fact exercise more power at the local level than in Congress." Seabright (1996) argues that incomplete contracts considerations matter in this respect because if everything could be specified in a contract, decentralization would be irrelevant; it is because contracts are incomplete that accountability matters. Then using an incomplete contracting framework, he argues that central powers are less accountable because they do not face electoral pressures for decisions in one particular sub-central unit. Bardhan and Mookherjee (1999) explain however that the effectiveness of capture at each level depend on specific political conditions that vary across jurisdictions. Marshaw and Rose-Ackerman (1984) argue that the support of producers to centralization or decentralization depends on the particular industry structures and on the specific results they may obtain. Rodden and Wibels (2002, footnote 12) argue that a key problem with informational arguments in favor of decentralization is that information-constrained voters might be more inclined to monitor the central government than local governments<sup>19</sup> and that shared or overlapping authority might make accountability more difficult. Shleifer and Vishny (1993) relate corruption incentives to the vertical structure of government. They argue that when central governments have a strong grip on the lower layers of government, corruption levels are lower becauce a double marginalization problem is avoided. Local corrutption levels can be reduced, however, when political competition is strong.

Spector (2007) and Woroch (1990) discuss the possibility that decentralized levels have shorter time horizons. This may be related to citizen mobility or political volatility, which may vary across regions. For example, it can be argued that the EU Commission (EC) is more immune to political volatility than the US Federal government because the main political parties are by design represented in the EC.

Bardhan and Mookherjee (2006) compare two type of non-benevolence (bribes in centralization, electoral capture in decentralization) with a variety of instruments available (user fees or taxation) in the case of

<sup>&</sup>lt;sup>19</sup>If we take election turnout as a proxy for the amount of information that voters possess, in Europe this turnout is highest for national elections, lower for regional elections and lowest for European Parliament elections (other European offices, such as the European Commission and the European Council, are not directly elected). This suggests that whereas the national policies are better monitored than regional policies, European policies are the ones that are worst monitored.

decentralization. Policy makers decide on the levels of service delivery for a segment where the only relevant costs are constant marginal costs (the fixed costs correspond to an exogenous upstream producer to whom deliverers buy). Results for each case are compared to a first and second best (with deadweight loss of taxation) in terms of efficiency, welfare (efficiency plus equity between two demand types for each region) and level of service delivery. User fee finance dominates decentralization with local taxation because voluntariness of local fee financing constraints the extent to which elites may be overprovided at the expense of non-elites. Decentralization with central grants may dominate centralization and user fees in specific cases.

Inman and Rubinfeld (1997b) provide an extensive and insightful review of the exemption from anti-trust legislation that the states often enjoy in the U.S. This exemption goes back to the US Supreme Court *Parker* case, where a policy decision by the state of California granted a cartel to producers of agricultural products overwhelmingly consumed outside of the state of California. Although Inman and Rubinfeld criticize this particular case for not taking spillovers into account, they claim that in many cases, in the absence of such spillovers, states' policies should be exempted from antitrust legislation if they satisfy the condition that the policy is enacted under conditions of political participation. Then, a state-action doctrine can be invoked in those areas where there are not sufficient reasons to invoke the Supremacy Clause and the Commerce Clause of the US Constitution,<sup>20</sup> which are typically used to defend the preeminence of the federal level. The impressive work of these authors is however vulnerable to two criticisms: first, it focuses on a model of "bright lines" regulation, whereas many regulatory decisions are made by jurisdictions that share regulatory powers; second, the more recent literature (see for example Bardhan and Mookherjee, 1999, and Treisman, 2007) shows that it is not clear that more participation goes hand in hand with decentralized policies. Nevertheless, this work shows that political participation, together with economic efficiency, is a key element in the role of decentralized powers. A role for the federal level certainly persists in the case of pure (national) public goods or positive spillovers if states' cooperation is precluded. In the case of negative externalities the situation is more complicated because

 $<sup>^{20}</sup>$ The Commerce Clause is part of the US Constitution, and it is positive in the sense that it prescribes that the federal level *can* intervene in interstate issues. The usually mentioned "dormant" or "negative" Commerce Clause is largely a court-developed doctrine about what the Commerce Clause did not say, and it is negative in the sense that it *restricts* states from discriminating against out-of-state residents (Inman and Rubinfeld, 1997, footnote 128, p. 1252).

universal agenda setting rules at the federal legislative may imply that a similar pattern of decisions is adopted at the federal and at the decentralized levels. In this case, federal intervention shoud be restricted to setting maximum levels of the externality. To improve the terms of the trade off between political participation and economic efficiency, a participation test should take into account the participation of states affected by spillovers. The authors argue that although almost all policies have jurisdictional externalities, these should be taken into account in the architecture of government only when they are significant, and that standards of significance similar to those used for market definition in anti-trust policy should be used (ie an impact of 5% difference). Interestingly, throughout their article, the authors argue that participation is best guaranteed by the legislative power<sup>21</sup> (through both well articulated policies and expost mechanisms for monitoring), and not by regulatory agencies.<sup>22</sup> More generally, this study shows that it is valuable to go beyond the theories that only consider the demand side of policy making (like the Tiebout model or in part the market preserving federalism theory) to open the black box of the supply side, and analyze the whole range of incentives and constraints that drive political and regulatory decisions.

#### 3 A Basic Model

Although the main contributors to the literature on fiscal federalism claim that their tools can be applied to regulatory issues as well,<sup>23</sup> in practice the tools have been mainly used to address issues of taxation

 $<sup>^{21}</sup>$ In some occasions, state legislative input and stakeholders participation has not been enough to prevent regulatory failures. In the restructuring of electricity in California, the chair of the committee that drafted the legislation "rather than encouraging the usual behind-the-scenes negotiations of competing bills put forth by different interest groups, he held marathon public sessions in which all stakeholders had to work on a single bill together, often into the wee hours of the morning" (Blumstein et al., 2002). Inman and Rubinfeld (1997) argue that it is precisely the complexity of regulatory issues (such as arguably the optimal restructuring policy for electricity) that makes political participation more important, and that this is better achieved at decentralized levels.

<sup>&</sup>lt;sup>22</sup>For an opposite view, Moore (2002) argues that complexity and a higher discount rate would have made regulatory agencies better qualified than the legislator in designing electricity deregulation in California.

 $<sup>^{23}</sup>$  Oates (1999, footnote 26, p. 1136) specifically claims that "the analysis of "regulatory federalism" is, in principle, analogous to that of fiscal federalism. The same general priciples concerning decentralization apply to fiscal and regulatory instruments."

and public expenditure,<sup>24</sup> and also environmental regulation.<sup>25</sup> Easterbrook (1983) and Inman and Rubinfeld (1997b) deal with federalism in regulation, but their analyses seem better suited to address regulation of standards and norms such as professional regulation or other business restrictions, and although inspiring in many respects, do not address some important specificities of network industries such as sunk costs and the relations between vertical segments with different geographic scopes. Thus there is not much work on the regulatory federalism of network industries specifically (some exceptions being Bardhan and Mookherjee, 2006, and Laffont and Pouyet, 2004). In particular there is no work on the role of decentralization in the introduction of competition (or the interaction between competition and regulation) in some segments of network industries. One specificity addressed below in this Section is the interaction between policy conflict and investment incentives in such industries. In Section 4, competition in some segments is introduced.

In the basic model introduced in this Section there are no information problems, and regulatory competition plays no disciplining role. The model also abstracts from laboratory federalism issues. There are conflicts of policy: local decision makers may be concerned both about total surplus in the regulated market and about the welfare of particular firms, input providers or groups of consumers. They may also be concerned about other issues that are not essential to central regulators, such as security of supply or inflation, both at the local level. This is different from the "bundling" of issues in Besley and Coate (2003), where there is one instrument for every issue and the regulatory issue is not salient for the electorate. Here it is assumed in a way that regulation is "too salient" (although not necessarily well understood), so salient that local governments want to achieve several objectives with regulatory policy. More is offered in the way of motivation of this assumption below.

There are two jurisdictions and potentially one central power that may take decisions that affect both jurisdictions. Initially, it is assumed that there is one firm in each jurisdiction, although in applications and extensions it is possible to adapt the model so that the initial firms merge, or so that there is entry of new firms in local markets. A regula-

<sup>&</sup>lt;sup>24</sup>The degree of decentralization is often measured by the percentage of public expenditure allocated to lower tiers of government; this may give a distorted picture of decentralization if the regulation of key industries is very centralized, since public expenditure on regulatory activities is low (which is compatible with the percentage of social welfare depending on regulation being high).

<sup>&</sup>lt;sup>25</sup>See Oates (1999). There is also a well developed literature on the issue of regulatory competition concerning legislation on takeovers. See for example Bebchuck and Ferrell (2001).

tory policy  $x_i$  (with i = 1, 2) can be set **locally**  $(x_i^L)$  or **centrally**  $(x_i^C)$ . If  $x_1 = x_2$ , policies are said to be uniform (centralized policies may be uniform or not, and local policy makers may set policy at the same level in both countries). If  $x_i^L = x_i^C$  policies are said to be equivalent. Local and central decision-makers have different objective functions. There is a firm decision (investment<sup>26</sup> in this basic model) prior to setting policy.<sup>27</sup>  $\pi_i$  and  $v_i$  are firm's profits and consumer surplus in country *i*.

In the remainder of this section it is assumed that no authority has commitment powers, so that investment is chosen by the firms before the (local or central) authority fixes policy. In this sense, it is an incomplete contracts model.

#### 3.1 Central regulation

There is one central regulator that fixes its part of policy  $x_i^C$  to maximize

$$\alpha \left[ \pi_1 + \pi_2 \right] + v_1 + v_2$$

subject to both firms willing to participate, where  $\alpha > 0$  measures the degree to which the welfare of shareholders weighs in the central regulator objective function relative to consumers (a measure of capture by the regulated industry).

Having in mind the cases of the US and Europe, federal jurisdictions may differ in the scope for capture, and commitment powers at the centralized level. For example, casual evidence suggests that the central level is more capturable by businesses in the US than Europe, and that the EU Commission has recently developed a more populist approach vis-à-vis consumers and has been less able to commit, perhaps because it is a relatively new institution in search of popular legitimacy. In the US there is a quid-pro-quo between large firms and large political parties and in the recent decades the Supreme Court has adopted a more pro-business stance (see NYT 03/16/2008). Many companies have a US national scope and most companies do not, at least as yet, have a European scope, and there are no effective pan-European political parties; so the institutions of supply and demand for political action are absent or seminal in Europe. But the ability to recruit experts due to

 $<sup>^{26}</sup>$ Higher policy levels, when the policy is price, benefits investment, but in equilibrium with commitment, the prices may be lower, for example because costs are lower or demand higher (which lowers prices due to scale economies). See Levine et al. (2005) and Evans at al. (2008).

<sup>&</sup>lt;sup>27</sup>Bardhan and Mookherjee (2006) assume that the fixed cost of the utility producing the service is financed by the central government out of central taxes in both regimes; accordingly they ignore the costs of such financing when comparing the two regimes, and focus on how variable costs are financed.

scale economies is probably similar.

Therefore, the central decision makers care about consumer and producer surplus, giving different weights to each, with the weights varying across central jurisdictions.

#### 3.2 Decentralized regulation

National or local regulators care about their specific producers and consumers plus about some additional objective. Each of the two decentralized jurisdictions chooses policy with the objective of maximizing total surplus in the regulated industry plus some other objective with a (common across jurisdictions) weight  $\theta$ :<sup>28</sup>

$$\underset{x_{i}^{L}}{Max\pi_{i}} + v_{i} + \theta\Omega_{i}$$

subject to a firm's participation constraint.

Hence the conflict of policies is located at the decentralized level. Of course, one can abstract from the difference in objective functions by assuming  $\alpha = 1$  and  $\theta = 0$ , and focus on the role of externalities and the type of interaction (dual and separate sovereignty, overlapping jurisdiction, complementary jurisdiction) between regulatory jurisdictions.

Examples of the second objective may include<sup>29</sup>:

-Favour some national or local input, eg local employment, local coal.

-Keep a management team in place with whom the political powers have implicit collusion contracts (for example, the government may develop rules and legislation to protect the firm against takeovers, in exchange for the use of the firm's cash flow to promote the politicians' objectives through investment in the media, sinecures for retired politicians, or political party financing).

 $<sup>^{28}\</sup>theta$  may represent an inverse measure of the transaction costs of lobbying of interest groups other than consumers and shareholders (for example, the management of an incumbent firm that want to keep their position in case of a takeover). These transaction costs are assumed to be lower at the local level, because collective action problems are lower at this level, there is less policy specialization and the mandates of agencies are vaguer. As it is sometimes said, at the local level all interested parties meet when they collect the children from the same school.

<sup>&</sup>lt;sup>29</sup>According to Joskow (2006), the privatization of state-owned utilities was meant to create high-power incentives but also "to make it more difficult for the state to use these enterprises to pursue costly political agendas." Note that the careful wording implies that after privatization the use of firms for a variety of objectives is not ruled out. "The components of these political agendas have included the use of state-owned monopolies for patronage employment, macroeconomic and redistributive policies, to favor domestic suppliers of fuel and equipment, and to funnel revenue to government budgets outside of the tax system."

-Keep domestic ownership of firms operating in the country (see Koehler, 2008, pointing out in particular that some countries seem to have a preference for the largest banking institution to be domestically owned, and finding that a bank operating in a country with less transparent and more prone to political intervention merger policy is less likely to be taken over by foreign institutions).

-Security of supply (used as argument by Spanish authorities to fend off the takeover attempt of Endesa by E.On).

-National security (used by US authorities to fend off takeover attempts of US ports by Asian funds).

-Avoid offshoring, although this could be more relevant for antitrust than for regulation of network industries, since it seems difficult that a company owning network assets can part away with these assets.

-Control local inflation in the short run (there are examples of this in Catalonia and Spain).

-Promote information society locally (be high in the broadband penetration rankings).

-Local health and safety or environmental concerns, which often jeopardize facility investments decided by national or regional reasons following legitimate national or regional goals.

-Promote national champions, ie large national firms that are able to compete at the international level (see Haufler and Nielsen, 2007).<sup>30</sup>

-Promote prestige projects, the so called "white elephants."

Public policies in general and regulation in particular have fixed costs, implying that small jurisdictions will have less formal policies and regulations (see Mulligan and Shleifer, 2005, on the fixed costs of regulation and the reference on vague law in small jurisdictions). The diversity of objectives captures a similar idea to the idea of "taxation by regulation" expressed by Posner (1971), although the latter did neither emphasize that nor explain why this sort of "taxation" was more prevalent at the lower levels of government. At higher levels there is more scope for policy specialization and the larger scale alleviates the conflict of policies

<sup>&</sup>lt;sup>30</sup>In Australia, France and the UK, antitrust regulators may consider the influence of a prospective merger on factors such as balance of payments, employment and regional development. See Head and Ries (1997, footnote 3, p. 1107). Neven and Röller (2000) show that when the relevant market encompasses all jurisdictions concerned, as would be the case in "global" industries, conflict will only arise if antitrust agencies pursue objectives that they are not supposed to pursue. Since conflicts arise frequently, these raises the suspicion that these other objectives indeed exist. This is so even when antitrust agencies are those of the US and the EU, where they are legally bound by quite "narrow" consumer welfare standards. These other objectives must weigh even more in national or sub-central jurisdictions where goals are more vaguely defined or even where other policy objectives are legally admitted.

(for example, if one input is scarce at local level, it may not be scarce in an integrated market). Also, diversity of objectives also derives from the sunk cost nature of investments in network industries coupled with local politics (see Troesken, 1996): local politicians have incentives to use sunk asets to satisfy local constituencies.

This kind of objectives that sometimes are expressed in vague terms give high discretion to local policy makers, for example in the objective to protect the "public interest" of state regulatory agencies that review electricity mergers in the US (see Wolak, 2007).<sup>31</sup> This vagueness is in the nature of public policy making and the transaction costs of politics, as explained in Dixit (1996).<sup>32</sup>

Notice that some of the examples may not be associated to higher profits, so it would not be captured by a decentralized version of  $\alpha$ . In fact, objectives such as promoting national champions may actually turn out to be costly for the firm's shareholders.

#### 3.3 Firms, investment and externalities

In this basic model, one firm in each country decides an investment level at cost  $C(I) = \frac{\varphi I_i^2}{2}$  prior to governments fixing policy. This investment has an impact on the demand function or consumer valuation (eg, in telecommunications markets, upgrading the network allows people to subscribe to highly valued broadband services; upgrading a transmission electricity network accommodates demographic growth or new transport systems, such as high speeed trains). In a unit demand framework, assume  $\varphi = 1$  so that  $\pi_i = x_i^C - \frac{I_i^2}{2}$ , and  $v_i = (I_i + tI_j) - x_i^C$ , with  $0 \leq t < 1$ , a parameter reflecting the inter-jurisdictional externality. This captures the idea that the network in one jurisdiction may have higher value to consumers when the neighboring jurisdiction has a better network.<sup>33</sup>

<sup>&</sup>lt;sup>31</sup>Joskow (2006, p. 24): "In the US and some other countries (eg Spain), default service prices or tariffs have been used to support a number of objectives other than promoting a robust retail market. These include commitments that retail customers will receive an immediate and sustained price reduction of some magnitude, stranded cost recovery considerations, income redistribution goals and consumer protection goals."

 $<sup>^{32}</sup>$ This may be related to the view expressed by Joskow (1974), of regulatory agencies as driven by a satisficing more than maximizing behaviour. This article observes that the statutes establishing most regulatory agencies are quite vague, and that the primary concern of regulatory agencies has been to keep nominal prices from increasing.

<sup>&</sup>lt;sup>33</sup>Regional Transmission Organizations such as PJM in US electricity are complex partnership undertakings, designed to internalize the externalities that pervade electricity wholesale and transmission systems and make them compatible with multiple jurisdictions.

#### 3.4 Analysis

#### Case A: Central Regulation

The regulatory decision vector  $(x_1^C, x_2^C)$  maximizes  $\alpha [\pi_1 + \pi_2] + v_1 + v_2$ . The solution  $(x_1^C(I, t), x_2^C(I, t))$  is a function of the vector of investments  $I = (I_1, I_2)$ , the externality parameter t, and  $\alpha$ . So the key thing is how investment and externalities relate to the expost central regulator's objetive function.

The central regulator fixes policy such that the expost surplus of producers is  $\alpha$  times that of consumers:

 $\Sigma x_i^C = \alpha \left[ \Sigma I_i (1+t) - \Sigma x_i^C \right]$ 

Therefore,  $\Sigma x_i^C(1+\alpha) = \alpha \Sigma I_i(1+t)$  and  $\Sigma x_i^C = \frac{\alpha \Sigma I_i(1+t)}{1+\alpha}$ . Then at the investment decision stage the firms maximize (assuming no discounting)  $\frac{\alpha \Sigma I_i(1+t)}{2(1+\alpha)} - \frac{I_i^2}{2}$  and

$$I_i^C = \frac{\alpha(1+t)}{2(1+\alpha)}.$$

Equilibrium investment increases with the level of spillovers and (non linearly) with the weight of producers in the central regulator's objective function:

$$\frac{\partial I_i^C}{\partial \alpha} = \frac{(t+1)}{2(\alpha+1)^2} > 0.$$
  
Case B: Local Regulation

In this case, externalities are not internalized and investment depends on the relationship between the second objective and investment. Expost, the regulatory authority maximizes  $\pi_i + v_i + \theta \Omega_i$  for a given level of investment, is it maximizes  $x_i^L + [(I_i + tI_j) - x_i^L] + \theta \Omega_i(x_i^L, I_i) = (I_i + tI_j) + \theta \Omega_i(x_i^L, I_i).$ 

Then  $\theta$  can be interpreted in Posner's terms as a measure of taxation by regulation which is politically attractive due to immobility of assets.

Policy and investment must be related to profit and consumer surplus in the same way as in the central regulation case, for the comparison to be meaningful. So given that the same weight is given to consumer surplus and profits at the local level, and given unit demand<sup>34</sup> and the sunk nature of investments, the decentralized regulator actually sets policy to maximize the second objective. Assume  $\Omega_i(x_i^L, I_i) = I_i \ln x_i^L - x_i^L$ , ie the second objective is concave so that there is an interior<sup>35</sup> optimal policy

<sup>&</sup>lt;sup>34</sup>So deadweight loss play no role in this basic analysis.

<sup>&</sup>lt;sup>35</sup>The second objective may also be interpreted as the reduced form of a number of several additional objectives, for example a combination of promoting national champions and keeping low inflation, in which case the intuition is that the regulatory policy (a regulated tariff, for example) must be not too high as to cause high inflation and not too low as to reduce the cash flow of expanding firms.

vis-à-vis this second objective, and the regulatory decision and private investment are complements. For example, the local investments of a national champion will be a springboard for international expansion (or used to satisfy security of supply concerns, or the promotion of certain fuels and/or technologies in addition to short run consumer surplus) only if accompanied by high revenues in the current period.

Then the optimal local policy is  $x_i^L = I_i$ .<sup>36</sup> At the investment decision stage, the firm anticipates this policy and decides investment to maximize  $I_i - \frac{I_i^2}{2}$ . The solution yields  $I_i^L = 1$ . This is higher than  $I_i^C$  if  $1 > \frac{\alpha(1+t)}{2(1+\alpha)}$ . In the case that  $\alpha = 1$  and t = 0,  $1 = I_i^L > I_i^C = \frac{1}{4}$ . As t increases,  $I_i^C$  increases but it never reaches 1 (it never even reaches 1/2) because t is bounded at 1. A similar logic applies for any positive value of  $\alpha$ . For  $I_i^C$  to be higher than 1 it should be the case that  $\alpha t > 2 + \alpha$ , which is not possible because t < 1 by assumption. In this example, investment is higher when regulation is at the local level because the second objective is used as a commitment device.

The key thing here is how policy and/or investment potentially relate to the second objective. We want this relationship to be general enough to accommodate a variety of possibilities, but also tractable enough to allow for an interpretable and insightful solution of the model.

If we introduce an additional parameter  $\gamma \in [0, 1]$  in the second objective, then  $\Omega_i(x_i^L, I_i) = \gamma I_i \ln x_i^L - x_i^L$  and  $x_i^L = \gamma I_i$ . Then the firm chooses investment to maximize  $\gamma I_i - \frac{I_i^2}{2}$ . The solution yields  $I_i^L = \gamma$ , and, in equilibrium,  $x_i^L = \gamma^2$ . To the extent that  $\gamma$  varies across jurisdictions, the regulatory policy would vary across jurisdictions, although here  $\gamma$  is kept constant for simplicity. Then when  $\alpha = 1$ ,  $I_i^L = \gamma < \frac{1+t}{4} = I_i^C$  if  $t > 4\gamma - 1$ . That is, if the externality is high enough relative to  $\gamma$ , central regulation achieves higher investment than local regulation. Or, if we let  $\alpha$  vary and fix the externality at some level, say  $t = \frac{1}{2}$ , then central regulation achieves higher investment than local regulation if

$$I_i^L = \gamma < \frac{3\alpha}{4\alpha + 4} = I_i^C$$

which happens when  $\alpha > \frac{4\gamma}{3-4\gamma}$ , ie when the weight of profits in the central regulator's objective function is high enough relative to the degree to which the combination of the regulatory policy and investment impact on the second objective of local regulators. Policy makers may value investment directly in this second objective for example if the capital providers in network industries also contribute to this second objective. For example, in Catalonia, the main shareholder in gas,

<sup>&</sup>lt;sup>36</sup>The first order condition is  $\frac{\hat{\Omega}_i}{\partial x_i^L} = \frac{I_i}{x_i^L} - 1 = 0.$ 

water, highways and telecommunications is "la Caixa," a large and very influential non-profit savings bank which captures the deposits of a large fraction of the population and is involved in social and cultural activities as a result of its foundational nature.

The following examples illustrate the role played by parameter  $\gamma$ :

-In periods of high inflation,  $\gamma$  is low. The weight of objectives for which a high level of firm investment is needed is low relative to the weight given to the objective of keeping prices low to contribute to reduce the rate of increase of the overall price level. In this case, we expect investment under a local regime to suffer. In periods of low inlfation, the opposite happens and  $\gamma$  increases.

-If the local policy makers have a concern for achieving some sectoral target such as scoring high in some measure of investment in renewable energy or the information society, then policy makers have a direct concern for investment. This investment was made in the previous period, but has a positive impact on the current period's second objective (it also has a positive impact on the current period's consumer surplus; policy makers may perceive ego rents for having a high reputation for respecting contracts) only when combined with a positive level of the current period regulatory instrument. High policy levels may mean higher firm cash flows which may be shared collusively between policy makers and managers; if the bargaining power of both colluding parties is intermediate, then some of the cash flow may be pocketed by stakeholders "in the normal way, giving them an incentive for investment" and some of the money may go to investment in the desired second objective.

The result that central powers not always facilitate better commitment echoes the arguments by Sah (1991) that authoritarian regimes may provide sometimes vary good policies, but their variability is higher than more partipatory regimes. A central agency in a government presided by Hugo Chavez may be very focused, but will probably have less commitment ability than a provincial unfocused agency.

If a more intertemporal perspective was taken, clearly the fact that the second objective of the local governments may change from time to time due to the global policy environment introduces a difference source of volatility that may be absent at the central level because of the more focused objective function at this level. This would increase the costs of investment reducing the relative attractiveness of the local regime.

Lack of commitment was assumed. Of course, if there is commitment and there are no other regulatory imperfections, there is no problem: everything could be regulated and markets would not be necessary. Some degree of imperfect commitment could be assumed (through some role for reputation or contracts) and the conclusions should have to be qualified accordingly.

One shortcoming of the present analysis is that regulatory decisions are treated as binary options (decided at central or decentralized level), whereas in practice different levels interact<sup>37</sup> in decisions that affect basically the same issue, for example decentralized bodies taking decisions subject to the constraint of some rule decided at the central level.

The conflict of policies at sub-central levels presents a dilemma between static and dynamic efficiency: although using only one instrument for several objectives is detrimental for allocative efficiency, for some of the objectives other than controlling market power this dilution of regulatory incentives may favour private investment, because there is less risk of expropriation; if regulatory responsibilities are allocated at the central level, ie without conflict of policies, sharper regulatory incentives mean that unless there is strong regulatory commitment the underinvestment risk may be higher. A key issue is how the second objective of local powers interacts with the regulated firm's invesment. One possible role for the central powers is to alleviate the conflict of policies so that the allocative efficiency at the sub-central level is increased. For example, improving security of supply in energy at the EU level may alleviate the conflict of policies in the member states between controlling market power and guaranteeing security of supply.

## 4 Interaction between Structural and Behavioral Regulation

When technology makes the introduction of competition in some segments possible, the possibilities for organizing the institutional architechture of regulation expand.<sup>38</sup> Different segments in the value chain of network industries may require regulatory intervention with different geographic scopes. It is very likely in this case that industry outcomes will depend on the interaction between several regulators. In Woroch (1990), cooperative or one single regulation may be dominated by two regulators even though two regulators does not yield constrained efficiency. Then it may be useful to analyze, in particular contexts, whether regulatory

<sup>&</sup>lt;sup>37</sup>Rodden (2006) argues that "authority over taxation, expenditures, borrowing, and policy decisions is inherently murky, contested, and frequently renegotiated between governments, with federal constitutions analogized to the "incomplete contracts" of industrial organization theory."

<sup>&</sup>lt;sup>38</sup>According to Stalon and Lock (1990) the frontiers between the market and regulation were being redrawn at the same time as the frontiers between the regulatory jurisdiction of the federal level and the states in the US. Article 210 of PURPA in 1978 on Qualifying Facilities provides an example of cooperative federalism or regulatory partnership.

interaction yields better results under cooperation or non-cooperation

Take an industry where there is a vertically integrated incumbent that faces the entry of n new firms, which must use some element of the incumbent's network at a regulated tariff a. Linear demand is assumed: P = 1 - Q. Regulators have an instrument of structural regulation, n, and an instrument of behavioral regulation, a.<sup>39</sup>

At the retail level, firms compete imperfectly; the entrant faces no marginal retail cost, and the only cost for the entants is the unit access price, a. Incumbent's operating costs are normalized to zero.

The analysis here looks at how the choice of n interacts with behavioral regulation. The choice of the number of access based entrants can be interpreted as a stance towards concentration in merger policy or as a policy to expand markets eg through network interconnection.

1) With Stackelberg retail competition, for given a, first the incumbent chooses its quantity  $q_1$ , and next the followers simultaneously choose their quantity  $q_n$ .

By backward induction, the analysis must start by the entrants' decision. At this stage, an entrant's profit is  $\Pi_n = (P(q_1, \Sigma q_n) - a)q_n$ .

The Stackelberg quantities and prices of the retail game equilibrium are:

$$\begin{array}{l} q_1^S = \frac{1}{2} \\ q_n^S = \frac{1-2a}{2+2n} \\ Q^S = \frac{1}{2} + n \frac{1-2a}{2+2n} \\ p^S = \frac{1}{2} - n \frac{1-2a}{2+2n} \end{array}$$

Then for given n and given a, the profits of the firms (incumbent and entrants, respectively) and the consumer surplus<sup>40</sup> are:

$$\begin{aligned} \pi_1^S(n,a) &= p^S q_1^S + anq_n^S = \frac{1}{2} \left[ \frac{1}{2} - n\frac{1-2a}{2+2n} \right] + an\frac{1-2a}{2+2n} \\ \pi_n^S(n,a) &= (p^S - a)q_n^S = (\frac{1}{2} - n\frac{1-2a}{2+2n} - a)\frac{1-2a}{2+2n} \\ CS^S(n,a) &= \frac{1}{2} \left[ Q^S(1-p^S) \right] = \frac{1}{2} \left[ (\frac{1}{2} + n\frac{1-2a}{2+2n})(\frac{1}{2} - n\frac{1-2a}{2+2n}) \right] \\ \text{The following cases are analyzed:} \end{aligned}$$

-First case: a decided by the federal regulator, and n decided by the local regulator. Assume that the federal regulator cares about a weighted sum of all producers' and consumers' surplus; the local regulator, assuming entrants are foreign, cares about the sum of the incumbent's surplus and consumer surplus. Then under a "bright lines" regulatory model, both regulators act non-cooperatively.<sup>41</sup>

<sup>&</sup>lt;sup>39</sup>For the distinction between structural and behavioral regulation, see Perry (1984). Gilbert and Riordan (1995) analyze the trade offs involved in the structural regulation of vertically related production units whose behavior is also regulated.

 $<sup>^{40}\</sup>mathrm{Given}$  linear demand, this is simply the triangle area between the demand curve and the market price.

<sup>&</sup>lt;sup>41</sup>We focus on simultaneous regulatory choices here. In Baron (1985) the federal

In this case, it can be shown that the access price in equilibrium is negative (to be interpreted as price below marginal cost, which has been assumed to be zero) and the equilibrium number of entrants is 1. Along the lines of Sarmento and Brandao (2006), it can further be shown that this case yields incumbent firm underinvestment, in case that an investment stage is added to the problem. That is because the access price is used to eliminate market power at the retail level, which reduces the incentives of the incumbent to invest. If (partial) deregulation implies disbanding one regulatory agency but not the other, as Woroch (1990) argues "market forces will adjust rates to attain marginal conditions for efficiency in the deregulated markets, but distortions will persist in regulated markets. As long as the industry falls short of achieving desired conditions in all markets, there is no guarantee that welfare will improve."

-Second Case: n decided by the federal regulator, and a decided by the local regulator. In this case, it can be shown that the optimal number of entrants is 0, because the federal regulator anticipates too high an access price to be set by the local regulator, who does not take into account the interests of the entrants.

 $\ -n$  and a decided cooperatively, also results in a zero number of entrants.

2) When retail competition is à la Cournot, quantities at the retail level are decided simultaneously. The reaction functions are

$$q_1(q_n) = \frac{1 - nq_n + a}{2}$$

$$q_n(q_1) = \frac{1 - q_1 - a}{2 + n}$$

$$q_n = \frac{1 - \frac{1 - nq_n + a}{2} - a}{2 + n}$$

Since *n* cannot be negative, the only meaningful solution is  $q_n^C = \frac{1-3a}{n+4}$ . Then  $q_1^C = \frac{1-n\frac{1-3a}{n+4}+a}{2} = \frac{2}{n+4}(a+an+1)$ ;  $Q^C = \frac{2an-a+3}{n+4}$ , and  $P^C = \frac{a+n-2an+1}{n+4}$ .

Profits and consumer surplus are:

$$\pi_1^C(n,a) = p^C q_1^C + anq_n^C = \frac{1}{(n+4)^2} \left( -7a^2n^2 - 14a^2n + 2a^2 + 3an^2 + 4an + 4a + 2n + 2 \right)$$

$$\pi_n^C(n,a) = (p^C - a)q_n^C = (3a - 1)^2 \frac{n+1}{(n+4)^2}$$

$$CS^C(n,a) = \frac{1}{2} \left[ Q^C(1-p^C) \right] = \frac{1}{2} \left[ \frac{2an-a+3}{n+4} (1 - \frac{a+n-2an+1}{n+4}) \right]$$
The new concentric choice of a and a are so follows:

The non cooperative choice of n and a are as follows:

-First Case: a decided by the federal regulator, and n decided by the local regulator. The problem of the federal regulator is:

regulator acts as a Stackelberg leader. It could be argued that local regulators have more discretion to make decisions more often, as followers of some central more permanent decision, but I start here with the Cournot case for simplicity. The institutional Stackelberg game is left for future research.

$$\underset{a}{Max}\left\{\alpha\left[\pi_{1}^{C}(n,a)+n\pi_{n}^{C}(n,a)\right]+CS^{C}(n,a)\right\}$$

Under a solution of the federal regulator's problem, if for example  $\alpha = 1$ , then the reaction function of the regulator is  $a(n) = \frac{3n^2 - 4n - 1}{8n^2 - 14n + 5}$ .

The problem of the local regulator is:

$$\operatorname{Max}_{n} \left\{ \pi_{1}^{C}(n,a) + CS^{C}(n,a) \right\}$$

Taking the first order conditions, the reaction function of the local regulator is  $n(a) = \frac{5-23a}{8a-2}$ . For this to be a positive number, we need  $\frac{5-23a}{8a-2} > 0 \rightarrow sign\{5-23a\} = sign\{8a-2\}$ . But if  $a = \frac{1}{k}$ , then for 8a-2 > 0 we need k < 4, and for 5-23a we need k > 23/5, and both inequalities cannot hold at the same time.

We conclude that an interior Cournot equilibrium does not exist in this case.

-Second Case: n decided by the federal regulator, and a decided by the local regulator.

The problem of the federal regulator is:

$$\underset{n}{Max}\left\{\alpha\left[\pi_{1}^{C}(n,a)+n\pi_{n}^{C}(n,a)\right]+CS^{C}(n,a)\right\}$$

From the first order condition, if  $\alpha = 1$ , then the reaction function of the central regulator using the second solution is  $n(a) = \frac{3a+8+8a-9}{6a-5+7a} = \frac{11a-1}{13a-5}$ . This reaction function is negatively sloped:

$$\frac{\partial \frac{11a-1}{13a-5}}{\partial a} = -\frac{42}{(13a-5)^2} < 0$$
  
Three points in this reaction function are:  
 $a = \frac{1}{2} \rightarrow n = \frac{11\frac{1}{2}-1}{13\frac{1}{2}-5} = \frac{21}{17} = 1.2353$   
 $a = \frac{1}{3} \rightarrow n = \frac{11\frac{1}{3}-1}{13\frac{1}{3}-5} = \frac{31}{25} = 1.24$   
 $a = \frac{1}{4} \rightarrow n = \frac{11\frac{1}{4}-1}{13\frac{1}{4}-5} = \frac{41}{33} = 1.2424$   
The problem of the local regulator is:

$$\underset{a}{Max}\left\{\pi_{1}^{C}(n,a)+CS^{C}(n,a)\right\}$$

The reaction function of the local regulator using the first order condition is  $a(n) = \frac{10n+3n^2+1}{32n+10n^2-5}$ , which is also negatively sloped:  $\partial \frac{10n+3n^2+1}{32n+10n^2-5}$ 

$$\frac{\frac{\partial \frac{1}{32n+10n^2-5}}{\partial n}}{\partial n} = -\frac{2}{\left(10n^2+32n-5\right)^2} \left(2n^2+25n+41\right) < 0$$

The number of firms and the access price are strategic substitutes, because both reaction functions are negatively sloped.

Three points in this reaction function are:

 $n = 1 \rightarrow a = \frac{10+3+1}{32+10-5} = \frac{14}{37} = 0.378\,38$   $n = 2 \rightarrow a = \frac{20+12+1}{64+40-5} = \frac{1}{3} = 0.333\,33$  $n = 3 \rightarrow a = \frac{30+27+1}{96+90-5} = \frac{58}{181} = 0.320\,44$ 

Looking at the examples, three points along each negatively sloped reaction function can be drawn and it can be seen that at the Cournot equilibrium 1 < n < 1.24 and 0.33 < a < 0.378. Hence the number of firms will be between 1 and 2 and the access price will be slightly higher than 1/3.

The policies that maximize the joint payoffs maximize:

$$M_{a,n}^{ax}\left\{\frac{(\alpha+1)}{2}\pi_{1}^{C}(n,a) + \frac{n}{2}\pi_{n}^{C}(n,a) + CS^{C}(n,a)\right\}$$

The solution of this problem involves a negative access charge and a number of firms between 4 and 5, which would probably be unacceptable to the local regulator, who does not take into account the interests of the entrants.

Summarizing the results of this Section, we can see that cooperation and non-cooperation yield different results, but the quantitative difference between the two depend on the specific details of the interaction.

Both in the US and the EU there has been a transition in the recent past from local (national or state) regulation of final prices of vertically integrated firms to central (European or federal) regulation of wholesale prices<sup>42</sup> accompanied by deregulation of final prices. However, the deregulation of final prices has not been universal and local powers still have a saying in the conditions of retail markets. Then, applying the above model, it would be useful to analyze this case as a transition from **local regulation** to **complementary regulation** with a potential final disappearence of the local level.

In addition to the benefits of avoiding non cooperative decision making when there is interaction, cooperation has other obvious benefits which must be weighed against the transactional costs of cooperation. Some of the benefits are described by Bernstein (1955, p.247): "Cooperation between governments in enforcing regulations helps to plug loopholes in enforcement machinery and enables different governments to

 $<sup>^{42}</sup>$ The joint regulation of telecommunications markets in the EU is cooperative, with back and forth communication between the National Regulatory Authorities and the EC on market analysis under EU rules, and national remedies with some EU veto power.

pool their information and sources of evidence about violations." Liberalization will typically require institutional cooperation, but cooperation has costs and may be inhibited by distributional concerns.<sup>43</sup>

#### 5 Concluding comments

In the long history of vertically integrated monopolies in telecommunications and energy, there was a historical trend to move regulation up in the vertical structure of government, at least form the local level to the state or nation-state level. This move alleviated the pressure on regulators to renege on the commitment not to expropriate sunk investments, although it did not eliminate the practice of taxation by regulation that was the result of multiple interest group action. Central or federal policy making is more focused and especialized and makes it more difficult for interest groups to organize. But it is not clear that under all conditions central powers will be associated with less underinvestment. When technology makes the introduction of competition in some segments possible, the possibilities for organizing the institutional architecture of regulation expand. Different segments in the value chain of network industries may require regulatory intervention with different geographic scopes. It is very likely in this case that industry outcomes will depend on the interaction between several regulators.

One of the benefits of decentralization is the possibility that under uncertainty mistakes in a single jurisdiction do not contaminate a whole reform package and the other jurisdictions can learn from these mistakes. A clear example is the fiasco in the deregulation of electricity in California in 2000. If the fiasco had taken place in the whole US, the future of electricity liberalization in the US and probably in other countries would have been much bleaker than it is for a long time.

Taking into account that liberalization of network industries has been described as "a long and winding road" and that there is little international consensus on many dimensions (eg broadband diffusion strategies), there is merit in leaving different jurisdictions follow their own way. Given that for this or other reasons (for instance legitimacy, political participation or subsidiarity, or because they face strong pressure to do so) local jurisdictions will try to intervene in regulatory policies, the relevant policy question is not so much which government level should regulate industries, but which should be the optimal form of participation of each level of government in regulatory policies, taking into account industry structure, technology, history and other constraints. The problem of lack of coordination is not unique of decentralized agencies; "independent"

 $<sup>^{43}</sup>$ See Baron (1985).

national or federal agencies may suffer from the same problem. Bernstein (1955) mentions as one of the weaknesses of independent agencies the lack of coordination with the general government.<sup>44</sup> Aubert and Laffont (2002, p. 45) argue that "even if reallocation of powers is within sight, the first priority may be to improve the regulations themselves -to favor horizontal or vertical cooperation of existing authorities- so that the ground is prepared for politically acceptable institutional reforms."

The difficulties of drawing bright lines to separate jurisdictional boundaries are illustrated by the following quote in the California Public Utilities Commission web page (visited on August 22, 2008):

Congress has preserved state commission jurisdiction over electric retail service and distribution facilities while granting FERC jurisdiction over transmission service and wholesale electric markets. Because the transmission and wholesale market issues have significant impacts upon the electric retail service and rates regulated by the CPUC, it is critical that the CPUC be closely involved in federal electric transmission rate and policy matters, as well as in design and operation of the wholesale markets.

For the same reason, it is important for the CPUC to participate in the North American Western regions transmission planning and coordination processes. Consequently, the CPUC engages with regulatory agencies, organizations and processes beyond California's borders and jurisdiction.

Non central governments intervene in regulated industries not only as regulators, but often as owners or as decision-makers in industrial policy. Paticipating in targeting univeral service schemes and reducing costs of using rights of way are promising tasks for local/regional governments even in a world of increasing liberalization. They can be delegated tasks for which higher level administrations do not want to be overwhelmed, and exercise these tasks with limited and accountable discretion in a disciplined framework.

The analysis here fits uncomfortably with a tendency to build lists of industries to be allocated to each level of government. For example, Aubert and Laffont (2002), Brennan (2003) and Smith (2000) provide examples of such lists. Typically, telecommunications networks are associated to the central level, together with electricity transmission and wholesale electricity markets, with distribution and retail electricity associated to the local or state level. As Woroch (1990) argues "the relative magnitude of spillovers can be reduced by expanding the size of

<sup>&</sup>lt;sup>44</sup>Another criticism raised by Bernstein is the lack of political leadership of agents that are explicitly separated from the political process. Political leadership may be needed to obtain public support for regulatory decisions.

jurisdictions. This reasoning argues for FCC control of all activities that trascend state boundaries, such as equipment standards, spectrum allocation, and satellite transmissions." At most, these lists should be general guidelines as to the relative weight of different levels of government in each industry segment. However, central levels may provide an input to policies even where there are few spillovers if there is a need for expertise, for information gathering to be used in yardstick competition, or for common standards. Conversely, even when externalities are significant, local levels may put in practice "laboratory federalism" or provide an input in the form of tayloring to local conditions and solving collective action problems (such as the common use of rights of way).

The relevant comparison in practice is often between independent centralized regulation (or two-tier, with the regulator in an informing capacity) or non-independent one-tier decentralized regulation (Bardhan and Mookerjee, 2006, can be interpreted along these lines), because decentralized powers do not need a regulator to improve information since they have enough information or becasue they don't have access to experts so that they face labour market constraints to set up an independent regulator, or because they have enough commitment powers and do not need to strategically delegate. However, the relative importance of independence varies depending on the location of the hyerarchical relationship; for example, one can argue that regulation is more independent at the national than at the European level, but in some European countries more independent at the national than at the regional level.

The federal level can ease the conflict of policies at the state level. For example, coordinating security of supply in energy policy at the continental level. A broader analysis along these lines should also take into account the role for global institutions: ITU, IEA, Internet governance organizations. The federal level has also a role in market creation or market integration, as a prior action before deciding whether to regulate the market or not. Creating a market and deregulating it are different things. In telecoms, efficiency would call for the creation of large geographic competitive markets; in electricity, large geographic markets which need a regulated transmission segment, and some form of intervention (such as regional transmission organizations in the US) that guarantees the coordination between wholesale markets and system operators. In the US electricity, the attempts to create a role for federal regulation (for efficiency reasons) preceded deregulation, although they largely failed. Then from a normative point of view, the question arises of what is the optimal industry structure and geographic scope for markets, in the Coasian sense of what are the boundaries that minimize the transaction costs of operating with markets.<sup>45</sup>

The introduction of competition at the federal level requires the development of new instruments or other policy reforms (for example, on universal service or security of supply) to satisfy the "other" policy objectives that local regulators used to satisfy with regulation or vertically integrated public ownership, when these policy objectives are legitimate, or the clarification that some of these other policy objectives are not legitimate (eg national champions). Otherwise, the federal introduction of competition will hardly be feasible. In some cases, the "second objective" will be legitimate in some aspects but not in others, eg industrial policy or fight against inflation or environmental objectives, which makes the issue a complex one. For example, Joskow (2006, p. 29) argues that "if policymakers are serious about competitive markets for power they will have to rethink the long tradition of relying on taxation by regulation of the electric power industry to implement policies in ways that hide the associated costs from taxpayers."

#### References

- [1] Armstrong, M.; Sappington, D. (2006), Regulation, Competition and Liberalization, *Journal of Economic Literature*, 44: 325-366.
- [2] Aubert, C.; Laffont, J.J. (2002), Designing Infrastructure Regulation in Developing Countries, in Beato and Laffont, eds., Competition Policy in Regulated Industries. Approaches for Emerging Economies, Interamerican Development Bank.
- [3] Bardhan, P.; Mokherjee, D. (1999), Relative Capture of Local and Central Governments, CIDER Working Paper C99-109; also in Eskeland, G., Devarajan, S., and Zou, H.F. (Eds.), Fiscal Decentralization: Promises and Pitfalls, World Bank. A shorter version of the paper has been published in American Economic Review, May 2000.
- [4] Bardhan, P.; Mookherjee, D. (2006), Decentralisation and Accountability in Infrastructure Delivery in Developing Countries, *Economic Journal*.
- [5] Baron, D.P. (1985), Noncooperative Regulation of a Nonlocalized Externality, Rand Journal of Economics, 16(4): 553-568.

<sup>&</sup>lt;sup>45</sup>It would indeed promote European integration to be able to have pan-European fixed and mobile phone networks (so that there would be only one common "national prefix," as the "1" shared by the US and Canada; and no roaming would be required when crossing a border), or to be able to buy in any country the same satellite TV platform with the possibility of subscribing to any channel in Europe. However, the Internet is probably reducing the relative gains that could be obtained with such initiatives.

- [6] Bernstein, M.H. (1955), Regulating Business by Independent Commission, Princeton University Press.
- Besley, T.; Coate, S. (2003), Elected versus Appointed Regulators: Theory and Evidence, *Journal of the European Economic Association*, 1(5): 1176-1206.
- [8] Beato, P.; Laffont, J.J. (2002), Editors' Introduction, in Beato and Laffont, eds., Competition Policy in Regulated Industries. Approaches for Emerging Economies, Interamerican Development Bank.
- [9] Bebchuck, L.; Ferrell, A. (2001), Federalism and Takeover Law: The Race to Protect Managers From Takeovers, in D. Esty and D. Geradin, eds., *Regulatory Competition and Economic Integration*, Oxford University Press, 68-94.
- [10] Blumstein, C.; Friedman, Lee S.; Green, R. (2002), The History of Electricity Restructuring in California, *Journal of Industry, Competition and Trade*, 2(1/2): 9-38.
- [11] Brennan, T. (2003), State and Federal Roles in Facilitating Electricity Competition: Legal and Economic Perspectives, Resources for the Future, Discussion Paper 03-24.
- [12] Caillaud, B.; Jullien, B.; Picard, P. (1996), National vs. European Incentive Policies: Bargaining, Information and Coordination, *European Economic Review*, 40: 91-111.
- [13] Casella, A.; Frey, B. (1992), Federalism and Clubs: Towards an Economic Theory of Overlapping Political Jurisdictions, *European Economic Review*, 36: 639-46.
- [14] Dixit, A. (1996), Economic Policy. A Transaction Costs Analysis of Politics, The MIT Press.
- [15] Easterbrook, F.H. (1983), Antitrust and the Economics of Federalism, Journal of Law and Economics, 26(1): 23-50.
- [16] Eichenberger, R.; Frey, B. (2006), Functional, overlapping and competing jurisdictions (FOCJ): a complement and alternative to today's federalism, in Ahmad, Brosio, eds., *Handbook of Fiscal Federalism.*
- [17] Evans, J.; Levine, P.; Trillas, F. (2008), Lobbies, Delegation and the Underinvestment Problem in Regulation, *International Journal* of Industrial Organization, 26(1): 17-40.
- [18] Gilbert, R.J.; Riordan, M.H. (1995), Regulating Complementary Products: a Comparative Institutional Analysis, *Rand Journal of Economics*, 26(2): 243-256.
- [19] Gruber, H. (2005), The Economics of Mobile Telecommunications, Cambridge University Press.
- [20] Haufler, A.; Nielsen, S.B. (2007), Merger Policy to promote "global

players"? A simple model, Oxford Economic Papers, forthcoming.

- [21] Hayek, F.A. (1948), The Economic Conditions of Interstate Federalism, in *Individualism and Economic Order*.
- [22] Head, K.; Ries, J. (1997), International mergers and welfare under decentralized competition policy, *The Canadian Journal of Economics*, 30(4b): 1104-1123.
- [23] Humplick, F.; Estache, A. (1995). Does Decentralization Improve Infrastructure Performance? in Estache, A., ed., *Decentralizing Infrastructure. Advantages and Limitations*, World Bank Discussion Paper 290.
- [24] Inman, R.P. (2008), Federalism's Values and the Value of Federalism, CESifo Economic Studies, 53(4): 522-560.
- [25] Inman, R.P.; Rubinfeld, D.L. (1997a), Rethinking Federalism, Journal of Economic Perspectives, 11: 43-64.
- [26] Inman, R.P.; Rubinfeld, D.L. (1997b), Making Sense of the Antitrust State-Action Doctrine: Balancing Political Participation and Economic Efficiency in Regulatory Federalism, *Texas Law Review*, 75(6): 1203-1299.
- [27] Joskow, P. (1974), Inflation and Environmental Concern: Structural Change in the Process of Public Utility Regulation, *Journal of Law* and Economics, 17(2): 291-327.
- [28] Joskow, P. (2006), Introduction to Electricity Sector Liberalization: Lessons Learned from Cross-Country Studies, in F.P. Sioshansi and W. Pfaffenberger, eds., *Electricity Market Reform. An International Perspective*, Elsevier.
- [29] Klevorick, A. (1996), The Race to the Bottom in a Federal System: Lessons from the World of Trade Policy, Yale Law & Policy Review/Yale Journal on Regulation Symposium: Constructing a New Federalism.
- [30] Koehler, M. (2008), Transparency of Regulation and Cross-Border Bank Mergers, mimeo.
- [31] Kovacic, (2007), Competition Policy in the European Union and the United States: Convergence or Divergence. IESE Conference on the 50th Anniversary of the Treaty of Rome.
- [32] Laffont, J.J.; Pouyet (2004), The Subsidiarity Bias in Regulation, European Economic Review, 88(1-2): 255-283.
- [33] Lehman, D.E.; Weisman, D. (2000), *The Telecommunications Act of 1996. The "Costs" of Managed Competition*, Kluwer Academic Publishers.
- [34] Levine, P.; Stern. J.; Trillas, F. (2005), Utility Price Regulation and Time Inconsistency: Comparisons with Monetary Policy, Oxford Economic Papers 57: 447-478.

- [35] Marshaw, J.L.; Rose-Ackerman, S. (1984), Federalism and Regulation, in Eads, G.C. and M. Fix, eds., *The Reagan Regulatory Strat*egy, The Urban Institute Press.?
- [36] Mookherjee, D. (2006), Decentralization, Hierarchies and Incentives: A Mechanism Design Perspective, *Journal of Economic Literature*, June 2006.
- [37] Moore, M. C. (2002), The Issue of Governance and The Role of The Regulator: Lessons from The California Deregulation Experiment, *Journal of Industry, Competition and Trade*, 2(1/2): 73-90.
- [38] Mulligan, C.B.; Shleifer, A. (2005), The Extent of the Market and the Supply of Regulation, *The Quarterly Journal of Economics*, November 2005: 1445-1473.
- [39] Neven, D.J.; Röller, L.-H. (2000), The allocation of jurisdiction in international antitrust, *European Economic Review*, 44: 845-855.
- [40] Nuechterlein, J.E.; Weiser, P.J. (2007), Digital Crossroads. American Telecommunications Policy in the Internet Age. The MIT Press, Paperback Edition.
- [41] Oates, W. (1999), An Essay on Fiscal Federalism, Journal of Economic Literature, 37: 1120-1149.
- [42] Oates, W. (2002), A Reconsideration of Environmental Federalism, in J. List and A. de Zeeuw, eds., *Recent Advances in Environmental Economics* (Cheltenham, U.K.: Edward Elgar, 2002), pp. 1-32.
- [43] Oates, W. (2006), The Many Faces of the Tiebout Model, In W. Fischel, ed., *The Tiebout Model at Fifty: Essays in Public Economics* in Honor of Wallace Oates (Cambridge, MA: Lincoln Insitutue of Land Policy, 2006), pp. 28-45.
- [44] Perry, Martin K. (1984), Scale Economies, Imperfect Competition, and Public Policy, *Journal of Industrial Economics*, 32(3): 313-333.
- [45] Posner (1971), Taxation by Regulation, The Bell Journal of Economics and Management Science, 2(1): 22-50.
- [46] Qian, Y.; Weingast, B.R. (1997), Federalism as a Commitment to Preserving Market Incentives, Journal of Economic Perspectives, 11(4): 83-92.
- [47] Riker, W. (1964), Federalism: Origins, Operation, Significance. Boston: Little Brown.
- [48] Rodden, J. (2006), The Political Economy of Federalism, in B. Weingast and D. Wittman, eds., Oxford Handbook of Political Economy, Oxford University Press.
- [49] Rodden, J.; Wibels, E. (2002), Beyond the Fiction of Federalism -Macroeconomic Management in Multitiered Systems, World Politics, 54: 494-531.
- [50] Rodden, J.; Rose-Ackerman, S. (1997), Does Federalism Preserve

Markets? Virginia Law Review, 83: 1521-1572.

- [51] Rubinfeld, D. (1997), On Federalism and Economic Development, Virginia Law Review, 83(7): 1581-1582.
- [52] Sah, R.K. (1991), Fallibility in Human Organizations and Political Systems, *Journal of Economic Perspectives*, 5(2): 67-88.
- [53] Sarmento, P.; Brandao, A. (2007), Access pricing: A comparison between full deregulation and two alternative instruments of access price regulation, cost-based and retail-minus, *Telecommunications Policy* 31(5), 236-250.
- [54] Seabright, P. (1996), Accountability and Decentralisation in Government: an Incomplete Contracts Approach, *European Economic Review*.
- [55] Seabright, P. (1998), Centralised and Decentralised Regulation in the EU, in *The New Palgrave Dictionary of Economics and the Law*, Macmillan.
- [56] Shleifer, A.; Vishny, R. (1993), Corruption, Quarterly Journal of Economics, 109: 599-617.
- [57] Smith, W. (2000), Regulating Utilities: Thinking about Location Questions, mimeo.
- [58] Spector, D. (2007), State Aids: Economic Analysis and Practice in the EU, IESE Conference on the 50th Anniversary of the Treaty of Rome.
- [59] Stalon, C.G.; Lock, R.H.J.H. (1990), State-Federal Relations in the Economic Regulation of Energy, Yale Journal on Regulation, 7: 427-497.
- [60] Stigler, J.; Friedland, C. (1962), What Can Regulators Regulate, Journal of Law and Economics, 5(1): 1-16.
- [61] Teske, P. (2004), *Regulation in the States*, The Brookings Institution.
- [62] Tiebout, C. (1956), A Pure Theory of Local Expenditures, *Journal* of *Political Economy*, 64: 416-424.
- [63] Tommasi, M.; Weischelbaum, F. (2007), Centralization versus Decentralization: A Principal-Agent Analysis, *Journal of Public Economic Theory*, Vol. 9, Issue 2, April 2007, 369-389.
- [64] Treisman, D. (2000), Decentralization and Inflation: Commitment, Collective Action, or Continuity, American Political Science Review, 94(4): 837-857.
- [65] Treisman, D. (2006), Explaining Fiscal Decentralization: Geography, Colonial History, Economic Development and Political Institutions, Commonwealth and Comparative Politics, 44(3): 289-325.
- [66] Treisman, D. (2007), The Architecture of Government. Rethinking Political Decentralization. Cambridge University Press.

- [67] Troesken, W. (1996), Why Regulate Utilities? The New Institutional Economics and the Chicago Gas Industry.
- [68] Weiser, P.J. (2001), Federal Common Law, Cooperative Federalism, and the Enforcement of the Telecom Act, New York University Law Review, 76: 1692-1767.
- [69] Weiser, P.J. (2003), Cooperative Federalism and Its Challenges, Michigan State DCL Law Review, 3: 727-739.
- [70] Wolak (2007), Merger Analysis in Restructured Electricity Supply Industries: The Proposed PSEG and Exelon Merger (2006), paper presented at POWER Conference, Berkeley, March 2008.
- [71] Woroch, G. (1990), Are Two Regulators Better Than One? Economics of Dual Regulation in Telecommunications, mimeo.