

Literature Review

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Introduction

The aim of this review is to present the state of the art on Policy Diffusion and Innovation in Public Policy. Our topic lies in the intersection of policy diffusion, innovation and public policy. Hence, we draw from the policy diffusion theories from Political Science, the literature on the policy reforms - especially on public goods and services - from Economics. Last, insights on governance, coordination and costs will be also drawn from Public Administration. The combination of these fields allows us to explain this research from a multi-model point of view. Apart from focusing on policy diffusion in general, we pay attention to how diffusion has been looked at from the point of view of network analysis. Specifically, we pay attention to the area of social economic network analysis and statistical network analysis.

Policy Diffusion and Innovation

Diffusion has historically been of concern of anthropologists and sociologists. The pioneering study of Walker (1969) asked two important questions that are still of scholarly interest. First, why do some states act as pioneers and adopt innovations. Second, how does innovation spread. In this context, the author defined innovation as a program or policy that is new to the adopting unit itself, independently of how many units have already adopted it. The author introduced the notion of policy transfer and identifies factors supporting and hindering diffusion.

One of the first papers that looked at diffusion of innovation among cities by Crain (1966) which demonstrated evidence of city-to-city diffusion of policies in the US. Based on the application of interpersonal influence to questions of intercity influence and adoption of innovation by municipalities. In this paper, published in 1966, the author looked at the adoption of the policy of fluoridation. Based on the literature on interpersonal relations and influence, the author describes a geographic diffusion hypothesis expecting that nearby cities influence each other when adopting innovations. In that paper, the author proposes that such diffusion resembles a network that has several centers and geographic clustering of adoption happens. In this sense, geographic proximity is only important because it can be used as a proxy for communication between the cities. The policy at the heart of this paper examines the diffusion of fluoridation in American cities from 1945 to 1960. The author finds that the adoption of this policy happens in stages - at the beginning experimentation was important and the cities that adopted the policy were spread across the country. In the second stage, the neighboring cities of the early adopters started to innovate. In the last two stages spreading continued reaching also cities that were initially resisting the policy. The authors pose the question about the opinion leaders and call for further research about why big and high-status cities were the leading innovators.

Policy innovation happens when a government adopts a new policy (Shipan and Volden 2008). The mechanisms of the policy adoption can be diverse. The policy innovation can be endogenous, coming from within the government, the residents or local stakeholders. Also, policy innovation can be a result of policy diffusion, e.g. the result of the spread of adoptions and innovations. The mechanisms of policy diffusion identified by the author include learning, economic competition, imitation and coercion.

- Gray (1973) - which developed the S-shaped curve model of policy diffusion - Berry and Berry (1990) - which developed a typology of policy diffusion mechanisms - Berry and Baybeck (2005) - which proposed a framework for analyzing the conditions under which different mechanisms of policy diffusion operate - Mintrom (1997a) - which examined the role of policy entrepreneurs in promoting policy diffusion - Mooney and Lee (1995, 1999) - which studied the diffusion of abortion and death penalty policies across US states - Haider-Markel (2001) - which analyzed the diffusion of same-sex marriage bans across US states - Balla (2001) - which examined the diffusion of HMO regulations across US states - Boehmke (2005) - which investigated the role of the initiative process in policy diffusion.

(Jackson and Yariv 2011) In an overview on social networks and diffusion. Structures can influence economic behavior, diffusion of behavior and policies. Epidemiological models can be useful to model economic phenomena, as members interact. Relevant to our research, units or agent might be interested about the proportion of units adopting a given action. For their decision, when a given adoption threshold has been reached, their incentive might increase and they might want to take an action - same or different - from that of the neighbors. Agents that don't adopt early policies can free-ride on the information on the results of the actions of the neighbors. In empirical literature diffusion has been analyzed through the lenses of social networks on several fields. These include: marketing, labor economics, political economy, etc.

The components of the network and the connections between them are important in applications such as contagion, learning and diffusion. Different subgraphs of the network are the components. Hence, if we consider Catalonia as the whole network, the several components are municipalities that form connections between them. These components are network partitions forming path-connected groups of nodes. A network that consists of only one component is a connected network. A network that has several components but doesn't have a cycle (e.g. several trees) is a forest. A special case of a forest is a star network where one node acts as a center, e.g. every link of the network involves that node. The set of nodes that the node i is linked to is called the neighborhood.

The *degree* of a node is the number of links involving that node.

Early literature about diffusion: Hybrid con adoption Ryan and Gross 1943, Griliches 1957, Drug adoption Coleman Katz, Menzel 1966

Importance of social connections

“opinion leaders” in the study of voting

Whereas, as typically in economics, there is a growing literature with studies on correlations, casual inference might not be possible without a specific setting. Therefore several authors use experiments as in

Various field experiments, such as those by Duflo and Saez (2003), Karlan, Mobius, Rosenblat, and Szeidl (2009), Dupas (2010), Beaman and Magruder (2010), and Feigenberg, Field, and Pande (2010),

Another way to reach casual inference is using structural modeling. Banerjee, Chandrasekhar, Duflo, and Jackson (2010)

Newman, Barabasi & Watts (2006),

The Handbook of Social Economics (forthcoming)

There are some popular texts such as Watts (2003) and Barabasi (2004), as well as a history of thought of the sociology literature by Freeman (2006) .

Goyal (2008)

Jackson (2008) synthesizes the analyses of networks from sociology, economics, statistical physics, mathematics, and computer science.

Greenhouse gas emissions trading (ET) system has been an emerging policy to govern global issues. In this setting, multiple authorities are part of a governance system, whereas they scale and interconnectedness might differ, leading to a polycentric setting Ostrom 2010 a 2010b

Social network analysis arose in Sociology (e.g., Boissevain & Mitchell, 1973; Coleman, 1958; Scott, 1991; Wasserman & Faust, 1997; Wellman, 1983) but has recently emerged as a crucial methodology in political science as well (e.g., Bach & Newman, 2010; Cao, 2009, 2010; Hafner-Burton, Kahler, & Montgomery, 2009; Hafner-Burton & Montgomery, 2006; Ward, Stovel, & Sacks, 2011).

The setting

The set $N = 1, \dots, n$ is the set of nodes that form part of the network. These nodes in our contexts are municipalities of Catalonia. Two nodes are either connected or not, - they cooperate or they don't. IMC is a reciprocal relationship, all the participants that form part of it have to agree to it. Such relationship can be modelled as an undirected network. Then, we have a graph (N, g) that consists of a set of nodes $N = 1, \dots, n$ and a $n \times n$ matrix g where g_{ij} stands for the relationship between the nodes. Such relationship can be weighted or unweighted (Jackson 2008). To represent the map of IMC in Catalonia as a network is appealing for several reasons. IMC is a relationship that might be advantageous or disadvantageous. Such relationship can be quantified by common statistical parameter, e.g.: correlations, covariances, regression coefficients, partial correlations etc. Such connections can be seen as links and modelled as paths through the network.

Partial correlation networks can provide valuable hypothesis generating structures, which may reflect potential causal effects to be further examined in terms of conditional independence (Pearl, 2000). When continuous data are multivariate normally distributed, analysing the partial correlations using the Gaussian graphical model (GGM; Costantini et al., 2015; Lauritzen, 1996) is appropriate. If the continuous data are not normally distributed then a transformation (e.g. nonparanormal transformation, Liu, Lafferty, & Wasserman, 2009) can be applied prior to applying the GGM. The GGM can also be used for ordinal data, wherein the network is based on the polychoric correlations instead of partial correlations (Epskamp, 2018). If all the research variables are binary, the Ising Model can be used (van Borkulo et al., 2014). When the data comprise a mixture of categorical and continuous variables, the Mixed Graphical Model can be used to estimate the PMRF (Haslbeck & Waldorp, 2016). Thus, networks can be estimated from various types of data in a flexible manner. Inter-municipal cooperation as a delivery mode is by definition a creates network(s) of local public service delivery in the context of network of municipalities. It has been argued in the literature WARNER, that IMC is complex process of cooperation where members exchange information and learn from each other. From the point of view of the literature of policy diffusion, the question arises how such interdependent structures shapes new policies and regulations. The already existing structures can be affected by processes that include learning, cooperation, competition etc. In case of countries being affected by policy diffusion, policy diffusion is mainly characterized by the fact that a policies in a given country are systematically conditions by prior policies of another one Simmons et al. (2006, 787).

(Boehmke et al. 2020) Walkers 1969 pioneering study.

(Gray 1973) Starting from Gray (1973), scholars have been interested in policy from a multidimensional point of view. The author asked questions such as how new ideas diffuse, why some are more innovative than others and whether there are certain patterns of innovation. At the time of this research, the frequency of adoption of policies showed an "S" shape, which is similar to an individual's learning curve. Adopters and non-adopters interact. Following this work, the rate of spread of adoptions can be expressed by

In this notation, A_t is the cumulative proportion of adopters of year t and $\Delta A_t = A_{t+1} - A_t$ (see Gray 1973; Berry and Berry 1990) of policy convergence (Bennett 1991) s (Holzinger et

al. 2008). y. Spatial econometric modeling has become the method of choice in the literature (Franzese and Hays 2007; Ward and Gleditsch 2008).

Statistical aspects of analyzing network data: Descriptive Statistics of the Networks: Books:

- Kolaczyk, E. & Csardi, G. (2014): Statistical Analysis of Network Data with R, Springer.
- Newman, N. (2018): Networks, Oxford University Press.
- Salter-Townshend, M., White, A., Gollini, I., & Murphy, T. B. (2012): Review of statistical network analysis: models, algorithms, and software, Statistical Analysis and Data Mining, 5(4), 243-264.

(Shipan and Volden 2008) Subnational governments of federal systems, the important role of municipalities, and decentralization serve as an interesting opportunity to experiment. Experimenting with policies can be advantageous for various reasons. Given the same national jurisdiction and similar context, the possibility to experiment with policies can be observed by other municipalities. The leaders that adopt first such policies and the laggards - who adopt them later - are not independent from each other. Neighborhood effects arise, e.g.: learning, competition, imitation or coercion. Whether the adoption of policy is a result of one of these mechanisms can tell a lot about the suitability and the expected effects of the policy. Policies, that result from learning, might be more effective. When learning, a municipality observes the outcome of the policy adopted by the leader. Based on the observed outcomes decides whether to introduce the policy or not. On the other hand, imitation doesn't focus on the result of the policy, it focuses on the municipality that adopted the policy. This is normally the case of small municipalities that look at what a bigger municipality of the neighborhood is doing. Importantly, imitation is not expected to produce the desirable outcome if the municipality that imitates and that is being imitated are different and not directly comparable. Coercion is a mechanism induced by a higher-tier government which - if not all the municipalities are equal - is not expected to be optimal. Last, scholars distinguish competition, which can be either advantageous or disadvantageous depending on the spillover effects in place. The authors of this paper investigate the antismoking laws across the US based on 675 largest cities over the period of 1975 and 2000. As expected, the leaders tend to be bigger cities, for the smaller ones learning is difficult, they have a higher probability to engage in competition or imitation. They have also less influence on higher-tier decision - coercion can be an issue for them.

As Sugiyama (2008) argues, a social network analysis can be a suitable approach to analyze policy diffusion for several reasons. Social networks allow for the spread of a phenomenon without allowing for not rational agents. Copying a neighbor is possible even if it is not advantageous for the imitating municipality. Diffusion of policies arises even if there is a lack of demand or resources.

Kammerer and Namhata (2018) explain the adoption of policies based on both internal and external factors.

Düpont and Rachuj (2022) analyze policy diffusion based on textual similarities in party manifestos using observations from nineteen Western countries from 1960 to 2016. Via text-as-data approach and machine learning (?) techniques. The authors move beyond the left-right position and estimate textual similarities based on the Manifesto Corpus (Krause et al. 2018). The authors show that the rhetoric of parties is mostly diffused within the

borders of a country or of a region. Also, the diffusion is higher between parties that belong to the same family of nations-. The authors don't find much relation between diffusion and benefits for the parties - hence the learning mechanisms is questions. On the other hand, they show evidence for a "herd behavior"

--Here we could test whether it is learning, imitations, or competition.

What we will look at is first, the party's past, second, the domestic competition, third, governing parties abroad, 4, EP factions, 5, transnational party organizations, other parties of the same family of nations.

Cook, An, and Favero (2019) argue that interdependence in decision-making behaviors of organizations and administrators is high importance. Using spatial econometric techniques, the authors distinguish between isomorphism, competition, benchmarking and common exposure mechanisms of spatial interdependence. In this paper, the authors aim at identifying the mechanisms behind commonalities and spatial dependence in public administration, and empirically analyze the questions using spatial econometric methods. Specifically, the authors look at budgetary decisions in Texas school districts. Then, including information on geographic proximity, district size are related to similarities. Additionally, the authors analyse public health administration dataset with spatial econometric techniques.

Danaeefard and Mahdizadeh (2022) In their review the authors look at five types of external determination model: National interaction model, regional diffusion model, leader-laggard models, convergence models, vertical penetration models. According to this review, the main subject of the studies have been how diffusion of policies affects the adoption of a policy.

Shipan and Volden (2012) that the literature on policy diffusion should be extended beyond the topics of policy adoption.

Burge and Rogers (2016) Diffusion mechanism involve learning, copying or strategic interaction such as competition. Such strategic interaction and competitive behavior has been at the heart of economics and used to explain how markets work, however, they have been not utilized to explain policy diffusion until recently. The authors the diffusion analyse local option sales taxes, which at the time of the analysis took up the biggest chunk of own source revenues then any other policy. Leaders have a different behavior then followers as they follow other leaders but are responsive to the followers. Panel data methods are used.

Christina Prell: The academic interest towards networks is large. Journals such as Connections, Journal of Social Structure and Social Networks focus exclusively on them

Empirical Background on Social and Economic Networks

One of the tools to estimate social networks is via surveys of the agents. Yet, agents might want to conceal their relationship, the intensity of these relationship might change over time, therefore several analysis of social networks is also based on anecdotal evidence. One of the most studied area of social economic networks is concerned with obtaining employment. Myers and Schultz, Pellizzarri, Corcoran, Darchener and Duncan. Social interactions also play an important role in conducting crime: Reiss; Glaeser, Sacerdote, Scheinkman.

One of the most important roles of social networks is to the flow of information. The capability of agents to learn from each other affects many aspects of their lives, starting from their employment, consumption or political opinion or voting behavior. One of the first studies on the diffusion of innovation Ryan and Gross; Hagerstrand; Rogers;

Coleman, Katz and Menzel look at the adoption of a new drug

Usually, when studying social and economic networks, the benchmark the random-graph models of networks are considered. Such networks are randomly generated and have several properties that can be compared to the observed network. The Poisson random-graph model is one of the most studied static random graph models or random networks. In a Poisson model, each pair of nodes has an equal chance of being connected, and the probability of a node having a certain number of connections follows a Poisson distribution. Whereas it is useful as a benchmark, the Poisson model lacks the possibility of clustering as the formation of links is independent. On the other hand in so-called “Small-World” networks, clustering happens with low diameters - length of the longest path between any two nodes.

To check:

Orenstein 2003, Rogers 2003, 2x True and Mintrom 2001 Fredkin 1993 Kilduff and Tsai 2003 Passy 2003 Collier Messick 1975 1983 Mooney and Lee 1995 Walker 1968 Comola Prina 2014 Braun Gilardi 2006 2 X Simmons Elkins 2004 Leenders 2002 Leifeld Cranmer 2016 Gilardi 2012 Berry and Berry 2007 Chyzh 2016 Haim 2016 Mohrenberg 2017 Berry and Berry 1990, Berry and Berry 2014 Wejnert 2002, Kapucu, Hu, Khosa 2017. Yi, Berry Chen forthcoming Marsh Sharman 2009 Mintrpm 1997 Mintrom Vergari 1998 Appuhami et al., [2011](<https://link.springer.com/article/10.1007/s11115-022-00618-9#ref-CR1>) “Appuhami, R., Perera, S., & Perera, H. (2011). Coercive policy diffusion in a developing country: The case of Public-Private Partnerships in Sri Lanka. *Journal of Contemporary Asia*, 41(3), 431–451. <https://doi.org/10.1080/00472336.2011.582713>

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- ") Shipan Volden 2012, Berry and Berry 2007, Esteller-More and Sole-Olle 2001

Marsden, Bernard, bernard el al

network autocorrelation models

[Figure 1, draw a map that involves the intensities]

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