Channels of transfer and institutional change in India – why influence of IRAs vary across sectoral regulatory arrangement?

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Abstract

The aim of this article is to explore variations in influence of IRAs in regulatory arrangements in Global South beyond functional explanations. This article maps regulatory arrangements in India using actor influence, concentration and coordination index. It's observed that sectors where reform was undertaken by exogenous actors, IRAs are the most influential actor vis-à-vis sectors where reforms were homegrown. To investigate this correlation, work on channels of transfer has been juxtaposed with theory of institutional change. Channels of transfer induce a type of institutional change which can contribute towards explaining variations in influence of IRAs in the existing regulatory arrangements. Our findings corroborate these expectations. As far as in electricity -a sector strongly exposed to diffusion agents- the sector's formal regulatory arrangement shows IRA as the most influential actor, whereas in telecom sector the pre-existing actor (the concerned ministry) has managed to retain the influence despite setting up an IRA.

Key Words: regulatory arrangement, channels of transfer, institutional change, India

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1. Introduction

Regulation is a curious concept. Like the idiom 'the blind men and an elephant', the understanding of regulation seems to have been shaped, as Koop & Lodge suggests, by the disciplinary differences. In its narrowest sense, regulation is understood as 'Command and Control' (CAC) by the state. In its broadest sense, it can be understood as an intervention which are, intentional and direct, and exercised by public actors over private actors (Koop & Lodge 2017). Black's conceptualization of regulation is little broader than Koop & Lodge's. Her conceptualization of decentered regulation, envisages intentional interference which can be exercised by both, public and private actors (Black 2002). Regulatory Governance, as a discipline, is about the study of political and policy processes of making and implementing regulation, encompassing varied understanding of regulation.

In the discipline of regulatory governance, Independent Regulatory Agencies (IRAs) are the main protagonist in most if not all the studies. These agencies, which would operate at an arm's length from ministries, diffused across geographies and inserted themselves in the pre-existing institutional setting and manifested in shape and form which was either consistent or different from the administrative system of the country. Bianculli et al's (2013) dataset on de jure institutional characteristics suggest how countries with varied administrative traditions have adapted the institutional model of regulatory agencies. Though IRAs are tasked with regulation, the sectoral regulation is undertaken not by one but many actors resulting in what can be termed as constellation or arrangement of actors (Mathieu et al. 2016; Jordana & Sancho 2004).

There is literature which has studied diffusion and IRAs. Regulatory arrangement is a relatively new development in the field of regulatory governance and it examines the complex web of actors whose interventions and interactions sustain the regulatory process in a given policy field (Mathieu et al. 2016). Though these concepts have been studied independently, they are also inter-linked. Diffusion is a process whereby diffusion agents inserts IRAs (micro-unit) into regulatory arrangement (macro-unit). As it is inserted in a pre-existing set up (and also different administrative set-up), there is a possibility that dispersion of power and influence among actors will vary. To explore this aspect, this paper, juxtaposes diffusion, diffusion agents and regulatory arrangements (including IRAs).

It is argued here that, to understand institutional outcomes attention needs to be paid to the dynamics of adoption including the role of intermediating agencies that act as vector for the

various channels of diffusion (Dubash 2012). Therefore, the objective of this paper is to identify how the configuration of formal regulatory arrangement in any given sector and country case, in particular the influence of IRAs, derives from the nature of diffusion agents (exogenous or endogenous). The diffusion of regulatory institutions did not happen in vacuum, rather this new form of administrative regulation diffused through a vector or agent and produced an outcome. The idea is to gauge variation in the influence of IRAs in the institutional outcome that was produced by diffusion.

Diffusion is defined as "*the process whereby information on the creation of new institutions is communicated through certain channels over time among the members of a social system in an uncoordinated manner, and prior adoptions of an innovation affect the probability of adoption for some of the remaining non-adopters in the population*" (Jordana et al. 2011). The authors in their paper separate diffusion as a process from the outcomes that it may or may not produce. Building onto their work this paper moves beyond the process and explores what outcome diffusion produced. When the channels of institutional transfer as presented by Jordana et al (2011) are juxtaposed with diffusion literature from the developing economies, it emerges that there are two types of diffusion agents i.e. exogenous and endogenous. The mode of institutional change that these agents induce are different as a result of which there are divergences in the formal regulatory arrangements across sectors within the same country.

From the literature it is known that institutions/actors do not operate in isolation. On any policy/regulatory decisions many institutions interact with each other before an outcome is achieved. The notion of regulatory space, suggests that resources are fragmented among the institutions/actors and thus is the influence. This enforces the idea that the role of agencies and the interaction between involved institutions/actors can adopt multiple configurations. The concept of regulatory arrangement helps in classifying what possible configuration this macro structure can take.

To undertake the analysis India has been opted as a case for analysis because a large number of agencies have been created, including at the state-level, and there is a significant variation, that merits further scrutiny. In addition, there had been attempts to undertake regulatory reform. Two reports, one by the erstwhile Planning Commission of India (now NITI Aayog) in 2006 "Approach to Regulation: Issues & Options" and the other by the second administrative reforms commission (ARC) constituted by Govt. of India in 2009, both recognized absence of a common regulatory philopsophy as there was inconsistency with respect to powers and

functions of the regulators, independence of these regulatory agencies, lack of uniformity in appointment and removal of members, etc. (Moilty et al. 2009 ; Planning Commission 2006). To overcome the absence of common regulatory philosophy and to guide next stage of regulatory reform, the Planning Commission of India proposed a Regulatory Reform bill, 2013, (which is yet to be passed by the Parliament), an overarching law to govern institutional framework of IRAs for public utilities.

This proposed regulatory reform aims to rationalize power and functions of IRAs. However, this renegotiation of regulatory space should be done in consideration with entire sectoral arrangement as capacities of actors will be enhanced or constrained (Scott 2001). A pre-requisite for having such a consideration would be to know how the sectoral arrangement looks like. Therefore, this paper undertakes mapping of formal regulatory arrangements of few sectors from India to explore their sectoral configuration and influence of IRAs vis-à-vis other actors.

The research question that this paper attempts to address is:

RQ: ***In the landscape of regulatory governance in India, a) how diverse are the regulatory arrangements of the sectors where IRAs exist, and b) can vectors of diffusion explain variations in regulatory arrangement and influence of IRAs in each sector?***

The paper explores the relationship between nature of diffusion agents and resultant formal regulatory arrangement by juxtaposing Jordana, Levi-Faur & Marin's work on global diffusion of regulatory agencies with Mahoney & Kathleen's theory of gradual institutional change. Findings of this paper supplements two kinds of existing literature i.e. one which deals specifically with IRAs and their institutional design etc. and other which deals with analysis of regulatory arrangements per se in Europe and Latin America.

Overall this paper is composed of six sections. Section one is introduction (including research question). Section two discusses theoretical framework and hyothesis. Section three explains methodology. Section four presents findings and section five discusses those findings. Section six concludes the paper.

2. Theoretical framework

This paper juxtaposes diffusion, diffusion agents and regulatory arrangements to observe whether the process of diffusion has an impact on institutional outcome. This section discusses these concepts. Diffusion is a process and diffusion agents are the vectors involved in the process, therefore they have been discussed together. Regulatory arrangement is an outcome of the process which induces institutional change hence, these two concepts are discussed together.

2.1 Diffusion & diffusion agents

The genesis of an agency which would comprise of non-partisan experts tasked with certain responsibilities can be traced back to the nineteenth century's United States of America (USA) (namely Interstate Commerce Commission & Sunshine Commission). With the burgeoning of the economy during earlier twentieth century, this non-partisan body of experts gradually evolved into present day equivalent of an Independent Regulatory Agency (IRA) after being accepted as an organizational form in the mainstream administrative framework of USA (Breger and Edles 2015; Pandey 2018). The institution of IRAs after attaining acceptance and popularity in the United States, diffused to Europe in the post war era. The diffusion of American philosophy of regulation i.e. growth of administrative regulation as said by Majone, altered the nature of European states from service provider to that of a regulator (Majone 1997). Majone conceptualized the growth of administrative regulation in Europe as the rise of the regulatory state.

At the heart of Majone's regulatory state was an IRA, an institutional development which had a high functional value. Based on this functional value argument, this new institution which would operate at an arm's length from the ministerial bodies, were taken to the economies where financial assistance was provided by the multilateral institutions such as the World Bank (WB) and the International Monetary Fund (IMF). Numerous studies have been undertaken on the diffusion of IRAs across the globe. One such study by Jordana et al (2011) observed that the process of regulatory agencification exploded during 1990s to 2002. Regulatory agencies were adopted across countries as a best practice measure with the emergence of several new agencies every year from 1990s to 2002 (Jordana et al. 2011).

It is well documented that in this interconnected world ideas travel and to do that they need a medium. Based on the functional value argument, the idea that the regulatory agencies are the best practice measures emerged and diffused through various channels. Jordana et al (2011) in

their study of diffusion identified two primary channels of institutional transfer. The National Patterns Approach (NPA) and Policy Sector Approach (PSA).

 According to the National Patterns Approach (NPA), the diffusion of regulatory agencies occurs pre-dominantly through national political networks. The national community of policy makers, who are the drivers of policy change, take cognizance of institutional changes in their own country or other countries to formulate policies to establish regulatory agencies, leading to their diffusion. The NPA further consists of National Transfer (NT) and International Transfer (INT) channel. In the former channel policy makers adapt regulatory agencies for diverse sectors within the country, whereas in the latter regulatory agencies are established after policy makers learn from experiences of the other countries. The Policy Sector Approach (PSA), emphasizes on existence of multiple political networks which lead to diffusion of regulatory agencies. Like NPA, PSA also consists of two sub-channels namely Sector Transfer (ST) and Intersectoral Transfer (IST). The article cites example of sectoral transfer where establishment of electricity regulatory agencies in one country led to diffusion of electricity regulatory agencies in other countries. Similarly, instance of intersectoral transfer shows how establishment of telecom regulatory agencies as a whole influenced creation of electricity regulatory agencies (Jordana et al. 2011).

In case of India, regulatory agencies (in this instance IRAs) were adopted in the aftermath of 1991 economic crisis. This crisis led to a paradigm shift in the economic policy as India embarked on the path of neoliberalism. From 1991 onwards IRAs have been established in many sectors such as electricity, telecommunications, securities market, insurance, real estate etc. The literature on diffusion of regulatory agencies in India suggests that as the Govt. of India turned towards multilateral institutions during the Balance of Payment (BOP) crisis in 1991, it led to India becoming a part of third wave to adopt the model of regulatory institutions (Arora 2018; Dubash and Morgan 2011; Dubash and Singh 2005).

Dubash (2001, 2005, 2012) in his numerous works has extensively analyzed diffusion of regulatory agencies in India. By tracing the reform story of India's electricity sector, he argues that in developing countries like India , the regulatory agencies were brought by the multilateral donor agencies (such as the World Bank and International Monetary Fund) on the pretext of depoliticizing the sector (Dubash 2012; Dubash and Rajan 2001; Dubash and Singh 2005). Similar opinion was echoed by other authors as well who have analyzed reform in power sector

(or water sector) that the institution of IRA was transplanted in India by an external actor (Mukherji 2004; Thiruvengadam 2016; Warghade 2016).

Contrasting the view that IRAs were established solely by an external actor, Mukherji (2006, 2009, 2014) in his analysis of institutional reform in India through the prism of telecom sector, concluded that the idea that India requires IRAs gestated over a period of time within the political and bureaucratic elites and when the opportune moment came, the reforms were driven by national community of policy makers (Mukherji 2006, 2009, 2014). Mukherji's argument of endogenously driven change is further supported by Echeverri-Gent's writing on reforms in India's securities market. The reform story seconds the idea that India's securities market require an institutional change were driven endogenously (John Echeverri-Gent 2007).

The channels of diffusion does provide pathways (NPA & PSA) through which diffusion can happen, but what it doesn't provide is the agents/vectors who follow these paths of diffusion (Dubash 2012). In order to explore the outcome of diffusion process, it is important to locate agents which follow those paths to create institutional change. From the above-mentioned examples from India, two kinds of diffusion agents can be identified. First, agents like the multilateral institutions which operates outside of jurisdiction of any country and second, national political network which works within the legal framework of any country. By juxtaposing channels of transfer and diffusion story from India, it can be deduced that NPA and PSA can be attributed to two types of diffusion agents. For PSA, which signifies existence of transnational network of actors, the significant diffusion agent is an exogenous actor whereas for NPA the it would be an endogenous actor as its places importance on the role of national community of policy networks.

For the purpose of this paper, exogenous diffusion agents are notably multilateral institutions such as the development banks namely the World Bank, New Development bank, African Development Bank etc., and other multilateral institutions like the International Monetary Fund (IMF), the World Trade Organization (WTO), etc. which disseminates its ideas and practices by either making conditional financial loans or in the form of technical assistance through their teams of international consultants operating across the globe. For example, the electricity regulator in India and the water regulator in the State of Maharashtra in India were set up based on terms and conditions of the World Bank loan. The financial and technical assistance brought with itself a foreign institution (considered as a best practice measure) and a team of consultants to implant the institution.

Endogenous diffusion agents consist of national community of policy makers such as bureaucrats, politicians or civil society groups etc. which after learning from the outside experiences introduce changes in their own countries. For example, regulatory institutions in securities and telecom sector in namely, Securities & Exchange Board of India (SEBI) and Telecom Regulatory Authority of India (TRAI), were set up by legislators in India learning from structural reforms taken elsewhere in the world.

Table 1: Exogenous and Endogenous Agents and their characteristics

Exogenous Agents	Endogenous Agents
• Multilateral/developmental institutions such as the World Bank, IMF etc. • Conditionalities imposed during technical & financial assistance induces change • Isomorphic transplantation of a standard model	• Involves national actors such as policy makers, civil society etc. • Induce changes after learning from structural reforms in other countries and sectors

2.2 Institutional change & Regulatory Arrangements

As mentioned earlier, post 1991 crisis India embraced a neoliberal model for economic development. The paradigm shift in the economic governance also brought with itself changes in institutions which were responsible for governance. The ideals of New Public Management (NPM) where the role of the state would be to steer the economy instead of rowing started gaining momentum. The state started separating its rule making and service delivery function. Interestingly IRAs were adopted as a preferred mode of regulation notwithstanding the nature of diffusion agents and channels of transfer. However, as stated in the introduction, the reports by the Planning Commission of India and ARC recognizes absence of a common regulatory philopsophy. While highlighting the divergences, the Planning Commission report states that the electricity regulators enjoy extensive powers vis-a-vis their peers.

To better understand arguments going forward it would be helpful to illustrate very briefly how reform process happened in few of the sectors (which also have been considered in this paper).

The reforms in the different sectors was undertaken at different point i.e. Securities market (1992), Telecom (1997), Electricity (1998), Aviation (2008). The previous section touches upon reforms in electricity, water and securities sector. Multilateral institutions especially the World Bank has been aiding Indian electricity sector since 1970's. Overtime they learnt that

the assistance was not creating a sustainable outcome and as a result they calibrated their strategy and made further assistance conditional upon structural adjustments. One of the conditionality was to establish an IRA to depoliticize tariff setting. As a result, between 1996-98 structural adjustment was undertaken across the country assisted by the World Bank's consultants, and IRA's were established for regulation of the sector (Précis 2001). Contrary to electricity sector, reforms in the telecom were driven by the political and bureaucratic elites. Realizing monopoly of government over rule-making, regulation and service delivery was unyielding, in order to facilitate private investments and promote competition, regulation aspect was taken away from the incumbent public sector operator and was vested with an independent regulator (Mukherji 2006, 2009, 2014).

Securities market in India was controlled by the Controller of Capital Issues (CCI) which was established in 1947. CCI controlled access to the equity market and would determine timing, price, volume of primary equity to be issued. In a way it became a market restrictor (Bhattacharya and Patel 2005). The role of CCI came into conflict with the new economic philosophy of India after economic reforms of 1991. As a result, the Govt. of India established a new independent regulator and abolished CCI. Aviation industry in India is primarily governed by Ministry of Civil Aviation (MoCA) and Directorate General of Civil Aviation (DGCA) (an autonomous regulator) established by the Aircraft Act, 1934. As the operational activities grew in India, Govt. of India established Airports Authority of India (AAI[2]) in 1994 which came to be the operator and regulator of civil airports in India. DGCA[3] was handed over responsibility related to licensing, safety and techical aspects. The debate from the 14th Lok Sabha (Lower House of Parliament) dated 22nd October, 2008 when the bill creating Airports Economic Regulatory Authority of India (AERA) was passed, suggests that the Govt. of India created an independent economic regulator (with limited mandated of tariff determination of major airports) to provide a level playing in order to attract private investments for developing airports and separate operation and regulation functions of AAI.

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[2] AAI was established after merging International Airports Authority of India (IAAI) and National Airports Authority (NAA) which were constituted in 1971 and 1985 respectively to manage international and domestic airports respectively in India. The merger was felt necessary in order to promote better operational integration and financial management (AAI Act, 1994)

[3] DGCA along with BCAS (Bureau of Civil Aviation Security) handles security of civil flights

The reform process as discussed above indicates there was an institutional change in all sectors and a separate institution of IRA was created. Yet, there are divergences as highlighted by the government reports. In the previous section, the paper identifies two different diffusion agents which could possibly induce different kinds of institutional change. James Mahoney & Kathleen Thelen (2010) in their theory of gradual institutional change state that the type of dominant change agent has an impact on the type of institutional change that takes place. Based on locus of institutional transformation, they delineated four modes of institutional change i.e. Displacement (the removal of existing rules and the introduction of new ones), Layering (the introduction of new rules on top of or alongside existing ones), Drift (the changed impact of existing rules due to shifts in the environment) and Conversion (the changed enactment of existing rules due to their strategic redeployment) (Mahoney and Thelen 2010). For this paper we would rely only on 'Displacement' and 'Layering' as literature identifies creation of a new institution rather than changes in existing institution.

After reforms new regulatory institution of IRA was embedded in an existing macro structure which Mathieu et al. (2016) refers to as Regulatory Arrangement. This regulatory arrangement represents existing sectoral configuration which regulates the sector and is an outcome of institutional change where power and influence is dispersed between the actors. The asymmetrical dispersion of power generates different kinds of regulatory arrangement. The literature identifies four possible types of regulatory arrangements and they are (i) Concentrated regulatory arrangement (concentration of decision-making influence in one actor and other actor(s) have little or no involvement), (ii) Consultative regulatory arrangement (concentration of decision-making influence in one actor but other actor(s) too are consulted), (iii) Cooperative regulatory arrangement (none of the regulatory actors have more influence than the others), (iv) Fragmented regulatory arrangement (dispersion of influence as several regulatory actors make specific regulatory decisions separately) (González 2017).

Based on above discussion of diffusion, diffusion agents, institutional change and regulatory arrangements, this paper argues that the nature of actor which would be most influential in any type of regulatory arrangement would be dependent on which type of diffusion agent is a dominant vector in the diffusion process. The hypotheses that this paper posit are:

H1: In a diffusion process, if exogenous agent is a dominant vector then it will induce institutional displacement and in resultant regulatory arrangement the most influential actor would be an IRA.

Or,

H2: Conversely, in a diffusion process, if endogenous agent is a dominant vector then it will induce institutional layering and in resultant regulatory arrangement IRA will not be the most influential actor
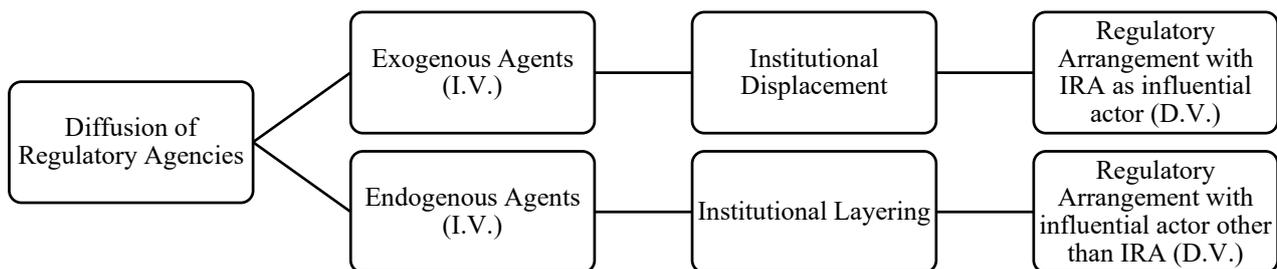
Fig 1: Diagrammatic representation of the proposed hypotheses

3. Methodology

In order to investigate types of regulatory arrangements (which is first part of the research question) the paper uses Actor Influence index, Concentration Index and Coordination Index. The Actor Influence Index measures how many regulatory issues an actor can influence and what is their degree of influence (i.e. formal influence). The form of participation has broadly been coded into six categories (refer Table 2) and based on the same scores are awarded to the actors. This measure can be calculated by summing up the number of decisions in which the actor has any form of participation and dividing this sum by the total number of regulatory issues in a sector (Mathieu et al. 2016).

Table 2: Scale for the measurement of actors' influence in individual decisions

Weight	Coding	Description
0	Not involved	The actor is not involved in the decision
0.2	Informed	The actor is informed about the planned content of the decision
0.4	Consulted	The actor is consulted or gives non-binding advice

0.6	Binding Position	The actor makes a binding opinion or initiates the decision proposal
0.8	Co-decisionmaker	The actor is a co-decisionmaker
1.0	Main decisionmaker	The actor is the main decisionmaker

Source: (Mathieu et al. 2016)

The Actor Influence Index is useful to compare actors within the sector, however this index across sectors is not directly comparable because number of regulatory responsibilities differs (or may differ) from sector to sector. For example, let's assume number of regulatory responsibilities in electricity, telecom and aviation sectors are 30, 20 and 10 respectively. Each of these sectors have three players, say, 'A', 'B' and 'C'. To calculate Actor Influence Index of actors 'A', 'B', 'C' in the electricity sector, the sum of scores (ranging from 0 to 1) awarded to them based on their involvement in decision-making on all issues would be divided by 30. Similarly for the actors 'A', 'B' and 'C' in telecom and aviation sectors, Actor Influence Index would be calculated by dividing individual scores of each actor by 20 and 10 respectively. Since denominator in each of the instances is not the same, one cannot directly compare these actors across sectors. It would be akin to comparing apples with oranges. This problem can be alleviated by computing Concentration Index which provides a standardized measurement on a scale of 0-1.

The Concentration Index measures the concentration of influence in actors in a regulatory arrangement. The idea is to find out the degree of asymmetry between the influence of the most influential actor of the arrangement and the influence of the remaining actors. To compute Concentration Index, one must first compute concentration score which is summation of the difference between the actor influence index of the most influential actor and that of the other actors. For example, let's assume a scenario where in any particular sector, Actor Influence Index of actors 'A', 'B' and 'C' are 0.60, 0.45 and 0.20 respectively. To calculate concentration score, first one must subtract from the actor influence index of A, actor influence index of B and C individually i.e. (0.60 – 0.45 = 0.15) and (0.60 – 0.20 = 0.40). Then add results of A-B and A-C i.e. (0.15 + 0.40) which will be 0.55. Mathematically it is represented as [0.60 x 2 – (0.45 + 0.20)].

Like actor influence index, concentration score also is not a standardized measurement. As a result, one cannot compare concentration score of two or more sectors. The standardization of influence on a scale of 0-1 (to facilitate comparison) is done by calculating the Concentration Index. The Concentration Index of 0 indicates that influence is equally distributed among involved actors, whereas of 1 indicates there is only one influential actor in the sector.

Continuing with the above example, the maximum difference between the influence of actors would be reached when influence of 'A' is 1 and that of 'B' and 'C' is 0. In such a scenario, concentration score of the sector would be 2 [{1 x 2 – (0 + 0)}] i.e. total number of actors in arrangement minus one. Therefore, to calculate concentration index, we divide concentration score by total number of actors in arrangement minus one. In case of above example where concentration score is 0.55 and number of actors in arrangement is three, the concentration index would be 0.55 divided by 2 i.e. 0.27.

The Coordination Index measures interaction among the actors involved in decision-making procedure. The Actor Influence Index measures how many regulatory issues an actor can influence which in turn indicates that every actor has different level of influence across various issues. On some issues one actor may be the main decision-maker whereas on other issues its influence may be restricted to providing non-binding recommendations. Similarly, influence of all the actors in decision-making will vary as per Table 2. Therefore, this index is calculated first by adding up all the number of actors that interact in each decision which will give coordination score.

Just as concentration score is non-comparable across sectors, coordination score cannot be compared as well across sectors just by summing up number of actors that interact in each decision, as number of actors and regulatory issues vary across sectors. To allow comparability, coordination score is transformed on a scale of 0 to 1. The minimal value of coordination score would be achieved when only one actor takes all decisions without involvement of others. The maximum value would be achieved when all actors interact on all issues. If in a sector 'a_1, $a_2 \ldots a_5$' are actors and 'i' are issues, then minimal value of coordination score would be reached when only a_1 takes decisions on all issues i.e. (a_1 x i). The maximal value of coordination score would be reaches when all 5 actors are involved in all issues i.e. ((a_1, $a_2 \ldots a_5$) x i).

To standardize on a scale of 0-1, minimal value of coordination index should become 0 and maximal value should become 1. To do so, from the absolute coordination score its minimal value should be subtracted. Thereafter, resultant number is divided by difference of maximum and minimal value.

Once concentration and coordination index are calculated, type of regulatory arrangement can be found out as per the classification provided by the González (2017) as shown below:

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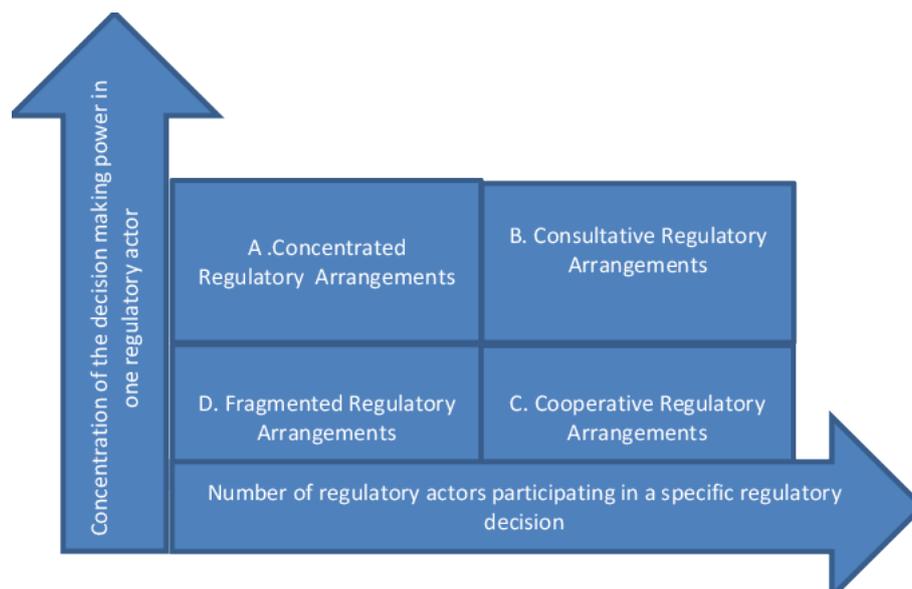
Fig 2: Types of Regulatory Arrangements (Source: González 2017)

3.2 Selection of Sectors

The selection of sectors was driven by following factors:

a) Presence of an Independent Regulatory Agency (IRA).

b) As the administrative framework in India is multi-level in nature with division of legislative functions into Union List, State List and Concurrent List, sectors were selected in order to represent each of the lists[4].

c) Institutional reforms were driven by either exogenous or endogenous diffusion agents.

Hence the sectors which have been analysed in this paper are:

Table 3: showing sectors whose regulatory arrangement has been studied in the paper

Sl.	Sector	Legislative list	Diffusion agent (as identified from literature)
1.	Electricity	Concurrent	Exogenous
2.	Telecommunications	Union	Endogenous

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[4] Refer Annexure C at the end for details on legislative divisions

3.	Securities Market	Union	Endogenous
4.	Aviation	Union	Endogenous
5.	Groundwater (Maharashtra)	State	Exogenous
6.	Groundwater (Uttar Pradesh)	State	Endogenous

3.3 Data collection and coding

As this paper explores formal regulatory arrangements of sectors, it is done by identifying the formal distribution of regulatory responsibility[5] and then by locating what influence actors have in those identified regulatory responsibilities. Data collection was undertaken using the current national sector-specific primary legislations. Electricity Act, 2003, The Indian Telegraph Act, 1885, The Aircraft Act, 1934, Securities Contracts (Regulation) Act, 1956, Maharashtra Groundwater (Development and Management) Act, 2013 and Uttar Pradesh Groundwater (Management and Regulation) Bill[6], 2017 are the primary legislation which govern electricity, telecom, aviation,securities and groundwater (in two states) sector respectively in India. After screening the primary legislations, regulatory responsibilities were identified and in accordance with Table 1 scores were awarded to the actors based on their involvement in decision-making procedure. For example, for two different issues in the electricity sector, scoring was done as following. Framing of tariff regulations is the sole prerogative of IRAs as per Electricity Act, 2003, therefore score of 1 was awarded to the IRAs. In the process of awarding the license, regulators have to give opportunity to public and other involved actors to raise objections/suggestion. These objections/suggestions are non-binding on the regulator. Therefore, score of 1 was awarded to CERC (national regulator) and SERCs (state level regulators) and rest actors were awarded 0.4 as they were consulted but their advice is of non-binding nature.

Whenever regulatory issues were not dealt in primary legislations or allocation of responsibility was ambiguous, secondary legislations (including information on institutions website) were

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[5] Regulatory responsibility can be understood as the formal allocation/delegation of policy/regulatory issues by/to an actor (involved in the regulatory arrangement of field) to elaborate regulations and/or take decisions based on legal framework governing the field.

[6] The State legislature of Uttar Pradesh is yet to enact the groundwater regulation. As of now the legislation is in the form of a bill and not an act. However, it adds to the analysis when studied in conjunction with ground water act of Maharashtra State.

referred to. For instance, The Indian Telegraph Act, 1885 dates back to the colonial era and it explicitly mentions that tariff has to be decided by the central government. However, wire-telephony has become obsolete, there exists competition in wireless domain and an IRA was establish to regulate the sector. Therefore, after reading the primary legislation (The Indian Telegraph Act, 1885) in consonance with secondary legislation of the sector (The Telecom Regulatory Authority Act of India, 1997) one can find out that central goverment is not involved in tariff setting and it is sectoral regulator's responsibility to regulte tariff matters (for which it issues rules and regulations). Thereby, only institution to be awarded score of 1 is the regulator. Further, as mentioned above in case of electricity sector framing of tariff regulations is the sole prerogative of IRAs as per Electricity Act, 2003, therefore score of 1 was awarded to IRAs. However, as per established procedure mentioned in the secondary legislations, the IRAs do ask stakeholders for non-binding suggestions. As a result apart from IRAs who were awarded the score of 1 earlier, other actors were awarded score of 0.4.

Identification of regulatory responsibilities and award of scores helps in calculating the actor influence index and concentration index. The results when interpreted tells us in the regulatory arrangement what is the influence score of all involved actors and who is the most influential, whether an IRA or any other institution.

4. Findings

The Table 3, as shown below, presents the actor influence index, concentration index and coordination index of the six sectors.

4.1 Actor Influence Index

Table 4 suggests that each of these sectors have one actor who influences most number of regulatory issues compared to any other actors in their respective sectors. However, the nature of most influential actor in these sectors are different. While in the case of groundwater (Maharashtra), electricity and securities sector its the sectoral IRA which has more formal influence, in case of telecom its the line ministry, for aviation its the autonomous regulator embedded within the ministry and for groundwater (Uttar Pradesh) its a council of body

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(District Council) headed by district magistrate (a bureaucrat who is chief executive of a district[7]).

4.2 Concentration Index

The concentration index of Groundwater (Maharashtra) is highest among the six sectors, followed closely by Electricity and Aviation sector, which means the concentration of influence i.e. the degree of asymmetry between the influence of the most influential actor of the arrangement and the influence of the remaining actors, is the highest in the Groundwater (Maharashtra) sector, followed by Electricity sector and Aviation sector. This is evident in Table 4 as well where MWRRA, SERC and DGCA have an influence score of 0.72, 0.57 and 0.60 which is much higher than the influence score of any other actors in their respective sectors.

Even though the influence score of the most influential actor in groundwater (Uttar Pradesh) (DGWMC), telecom (DoT) and securities (SEBI) sector is in proximity to that of electricity (SERC) and aviation sector (DGCA), the concentration index in these three sectors is significantly lower with groundwater (Uttar Pradesh) being the lowest at 0.24. This signifies that influence score of other actors involved in these sectors is also on the higher side. This in turn signifies that there are two kinds of possibility, either similar regulatory responsibilities are formally distributed between two or more actors with final authority being vested in the most influential actor, or, responsibilities are distributed in a manner that there are no overlaps, and each actor has exclusive jurisdiction on the allocated responsibility.

4.3 Coordination Index

The coordination index is highest for Electricity sector (0.33) which suggests that vis-a-vis other sectors there is more interaction between actors in decision-making process. The scores of Groundwater (UP), Groundwater (MH) and Telecom i.e. 0.26, 0.23 and 0.17 suggest that fewer actors in these sectors interact in decision-making process. On other end of the spectrum is Aviation secctor where no actors interact in decision-making whereas in Securities sector there is very little interaction.

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[7] An administrative division of second level. India constitutes of 7 Union territories and 29 States. For administrative purposes, each state is further divided into districts.

Table 4 : Actor Influence score and Concentration Index of sectors

Electricity*			Telecom			Aviation		
Actors	**Nature of actor**	**Actor Influence Index**	**Actors**	**Nature of actor**	**Actor Influence Index**	**Actors**	**Nature of actor**	**Actor Influence Index**
SERCs	IRA	0.57	DoT	Ministry	0.59	DGCA	Autonomous regulator[8]	0.60
CERC[9]	IRA	0.20	TRAI	IRA	0.44	MoCA	Ministry	0.16
CEA	Technical Authority	0.17	USOFA	Ministry	0.13	AERA	IRA	0.13
Distribution Licensee	Utility	0.13				BCAS	Autonomous regulator	0.10
Concentration Index for sectors								
Electricity = 0.49			Telecom = 0.32			Aviation = 0.47		
Coordination Index for sectors								
Electricity = 0.33			Telecom = 0.17			Aviation = 0.00		

*7 more actors with score of 0.07 and less not shown here due to low magnitude of influence score

[8] Embedded in line ministry and deals with safety issues

[9] It is pertinent to point out that both, CERC and SERCs, are sectoral regulator. CERC is central level regulator which mainly regulates public sector generating companies owned by central government, intra-state transmission of electricity and any other matter involving central & state govt. or two or more state govts. etc. SERCs are state level regulator which regulates generation, transmission, distribution and other issues at the state (sub-national) level. As the number of issues to be regulated at state level is higher (especially due to distribution related matters), the role of state level regulators stands out prominently compared to central level regulator.

Table 4: Actor Influence score and Concentration Index of sectors

| Securities			Groundwater (Maharashtra)			Groundwater (Uttar Pradesh)		
Actors	**Nature of actor**	**Actor Influence Index**	**Actors**	**Nature of actor**	**Actor Influence Index**	**Actors**	**Nature of actor**	**Actor Influence Index**
SEBI	IRA	0.58	MWRRA	IRA	0.72	DGWMC	Public unit @ district level	0.55
Central Govt.	Govt. of India	0.25	GoM/GSDA[10]	State Govt	0.39	MWMC	Public unit for Urban áreas	0.40
Stock Exchanges		0.25	WWRC	Committee	0.17	GoUP/GWD[11]	State Govt.	0.31
			District Authority	Bureaucrat	0.15	GPGWSC	Public unit for rural areas	0.31
			Panchayat	Local self Govt.	0.10	BPGWMC	Public unit @ block level	0.28
			CGWA	Central Govt.	0.03	State Council (SGWMRC)	Regulatory council	0.24
Concentration Index for sectors								
Securities = 0.33			Groundwater (Maharashtra) = 0.55			Groundwater (Uttar Pradesh) = 0.24		
Coordination Index for sectors								
Securities = 0.04			Groundwater (Maharashtra) = 0.23			Groundwater (Uttar Pradesh) = 0.26		

[10] GSDA is a department under Water Ministry of Govt. of Maharashtra (GoM). Hence, they have been clubbed together

[11] GWD is a department under Water Ministry of Govt. of Uttar Pradesh (GoUP). Hence, they have been clubbed together

5.1 Types of regulatory arrangement

In this section, we would examine what kind of regulatory arrangements do these six sectors have based on figure 2. This will help us in finding out how diverse are the formal regulatory arrangements of the sectors were IRAs exist.

Graph 1: Type of Regulatory Arrangements
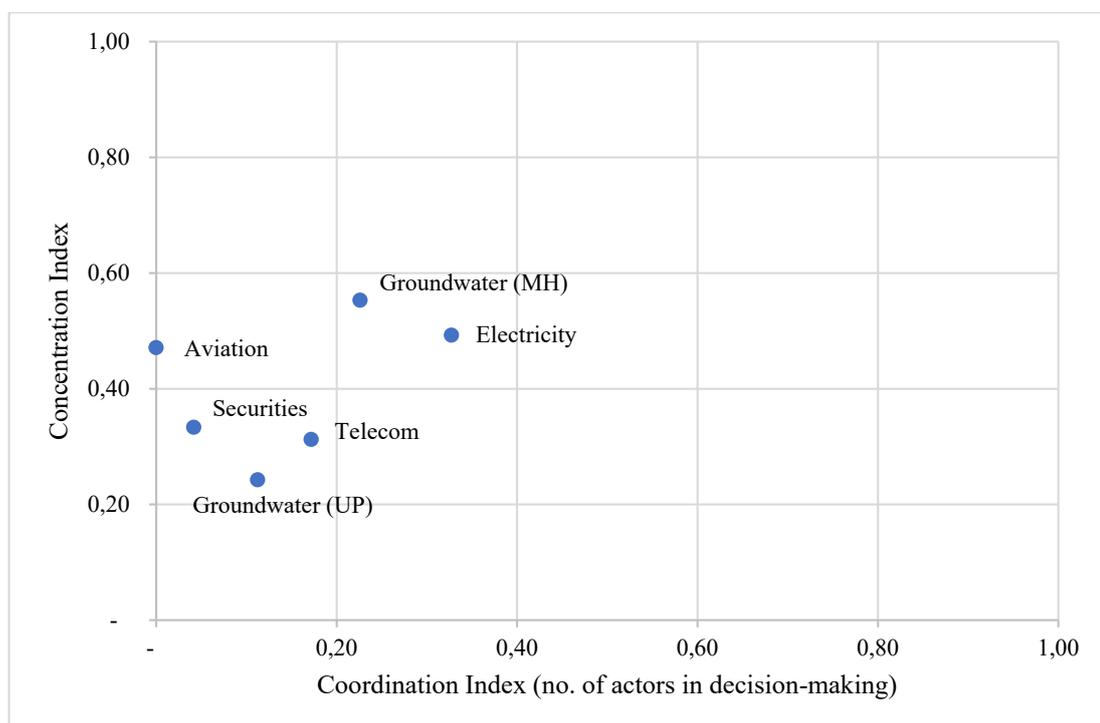
Analysis of graph 1 based on figure 2 suggests that all six sectors can be classified between concentrated and fragmented regulatory arrangements. Whereas, Aviation, Securities, Telecom and Groundwater (UP) can be classified as having fragmented regulatory arrangement, Electricity and Groundwater (MH) have concentrated regulatory arrangement.

However, is it appropriate to undertake a strict classification of sectors into fragmented and concentrated regulatory arrangements and ignore the interaction among actors (however little they are)?

As per the definition provided by González, in fragmented regulatory arrangement there is no interaction between actors in decision-making process. However, from the graph 1, one can observe that there is interaction between actors in all sectors, except Aviation, but at varying

degrees. The low coordination score suggests that out of all actors involved in a sector, only few interact on every issue. Therefore, it would be prudent to consider sectors such as Telecom, Electricity and Groundwater (MH) having an element of consultative type of regulatory arrangement (though there is no strict threshold to decide above what score it should be considered).

Table 5: Summary of findings

Sl.	Sector	Type of Regulatory Arrangement
1.	Electricity	Concentrated-consultative
2.	Telecommunications	Fragmented-consultative
3.	Securities Market[12]	Fragmented
4.	Aviation	Fragmented
5.	Groundwater (Maharashtra)	Concentrated-consultative
6.	Groundwater (Uttar Pradesh)	Fragmented

5.2 Vectors of diffusion and regulatory arrangement

In this section we try to answer the second part of the research question and test our hypothesis by exploring the relationship between the nature of diffusion agents (exogenous or endogenous) and resultant formal regulatory arrangement. Before proceeding, we ought to keep in mind that the traditional administrative model of governance in India is hierarchical in nature. The line ministries would govern the sectors through various departments which would have an attached and subordinate offices (Moily et al. 2009). The reforms initiated post 1991 were aimed at restructuring the governance model in these sectors.

The key characteristic of an IRA, as provided by the World Bank handbook, is independence in decision making. As the principal reason for creating IRAs is to depoliticize tariff setting and other regulatory decisions, agency should be able to make a decision without prior approval of government and such decisions can only be overruled by judiciary or any other appellate authority. Therefore, for a regulatory agency to be independent, it should have organizational independence (organizationally separate from existing ministries and

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[12] In Securities sector there is only one issue on which there is an interaction between two actors. Due to very low magnitude of score, its interaction has not been considered.

departments), financial independence (an earmarked, secure, and adequate source of funding), and management independence (autonomy over internal administration and protection from dismissal without due cause) (Brown et al. 2006).

Table 6: Juxtaposing type of regulatory arrangement with diffusion agents

Sl.	Sector	Type of Regulatory Arrangement	Influential Actor (and nature of actor)	Diffusion agent
1.	Electricity	Concentrated-consultative	SERCs (IRA)	Exogenous
2.	Telecommunications	Fragmented-consultative	DoT (Ministry)	Endogenous
3.	Securities Market	Fragmented	SEBI (IRA)	Endogenous
4.	Aviation	Fragmented	DGCA (Autonomous regulator)	Endogenous
5.	Groundwater (Maharashtra)	Concentrated-consultative	MWRRA (IRA)	Exogenous
6.	Groundwater (Uttar Pradesh)	Fragmented	DGWMC (Public unit)	Endogenous

In Table 2, 3 and Table 5 the paper has identified diffusion agents, actor influence index and type of regulatory arrangements respectively for each sector. To test our hypothesis and answer the second part of the research question, findings have been put together in this table.

The sectors where diffusion agents are 'exogenous' are Electricity and Groundwater (MH) and in both of these sectors IRAs are the most influential actor. In remaining four sectors i.e. Telecommunications, Aviation, Securities and Groundwater (UP), the diffusion agents are 'endogenous' and most influential actor is not an IRA, except for Securities sector where the most influential actor is an IRA. Therefore, the results in Table 6 do confirm our hypothesis that there is a relationship between type of diffusion agent and nature of most influential actor in a regulatory arrangement. The outlier is the Securities sector and one of the plausible reason for this could be the sectoral peculiarity. Unlike utilities/infrastructure sector, which is a natural monopoly and subjected to domestic political pressure (either due to politicization or presence of public sector unit), in securities market that is not the case.

To explore whether diffusion agents induce a type of institutional change we will delve into the reform process in the sectors except for securities sector which is an outlier. In section 2.1 and 2.2 the paper presents a brief about reform process which have been undertaken in these sectors. Mukherji (2014) writes that when the Govt. of India established the telecom regulator

(TRAI), it didn't abolish the existing institutional body i.e. Department of Telecom (DoT) which had sole authority over policy making, regulatory functions and service delivery. Instead, powers and functions were re-allocated between DoT and TRAI and DoT continues to be most influential actor. According to him this type of institutional change was 'layering' in nature as a new institution was woven around existing institution.

In case of electricity sector, it is well documented that the institutional change introduced were alien to existing administrative tradition. Dubash & Rajan's (2001) analysis of reform in power sector concluded that the introduction of IRAs happened through backdoor. The new institutional experiment which breaks away from the existing hierarical model, and would operate independentally, was not tested through national politics. Even the World Bank's report, Précis (2001), highlights how in line with their philosophy of depoliticization of sector, a structural change was required to be undertaken. There was displacement of existing rules and new ones were established. Therewas an institutional displacement in the sector.

The reforms in Aviation sector is a classic example of 'credible commitment' argument which states that when government pushes for privatization and liberalization reforms, it creates an indepedent regulator to bind itself to the policy decision which gives necessary safeguards to investors (Gilardi 2004). From our discussion in section 2.2 it can be inferred that creation of an independent regulator i.e. AERA, was very similar to the philosophy followed for telecom sector which was to separate service delivery and regulatory functions of incumbent which in this instance was AAI. The IRA was created but with a limited mandate i.e. to determine tariff for only major airports. The incumbent actor i.e. DGCA (an autonomous regulator embedded in the ministry) continues to be the most influential player in the sector.

Maharashtra Water Resource Regulatory Authority (MWRRA) was established as an independent water regulator in the Indian state of Maharashtra in 2005 in pursuance of reform agenda driven by the World Bank. After its enactment it became a model institution for water resource regulation in India was adopted by six other states in India (Warghade 2016). The World Bank has been providing further assistance in the area of groundwater in the State of Maharashtra under Rural Water Supply and Sanitation Project (World Bank, 2010). It is no coincidence that an IRA is the most influential actor in regulation of groundwater which was prior to reforms regulated by the government department., The World Bank's toolkit for private sector participation in water services puts emphasis on consultation and consensus-building with stakeholders, which explains significant influence of other actors as well in the regulatory

arrangement (World Bank, 2006; Dubash and Morgan 2013). This kind of institutional arrangement is vastly different from earlier arrangement as it has completely displaced older hierarical model. Therefore, in this sector too there has been an institutional displacement.

In the State of Uttar Pradesh, Uttar Pradesh Water Management and Regulatory Commission (UPWMRC) was established in 2008 on the lines of MWRRA, as stated above. However, it remained a paper authority and never became operational (Koonan and Bhullar 2012). It is interesting to note that even though the World Bank is providing assistance to the State of Uttar Pradesh in the area of groundwater, the proposed regulatory model is based on the model groundwater management bill of the Central Govt. of India which does not specifically require establishment of an IRA for the groundwater. For the time being, as the proposed reform in the State of Uttar Pradesh is based on model bill of Govt. of India, it can be said to be endogenously driven where maximum influence has been proposed to be vested in an institution which is neither an IRA or an incumbent. Its a council comprising of representation from various departments of state govt., instead of one dept., thereby pointing towards another instance of institutional layering (however a concrete remark can only be made once the bill is passed in the State legislature).

The findings in Table 6 and above discussion on sectoral reforms confirm our hypothesis that there is a correlation between nature of diffusion agent, mode of institutional change and influence of IRAs in the resultant formal regulatory arrangement in case of infrastructure sectors. The outlier to this scenario is Securities sector which calls for more research on this subject as more sectors from the field of finance can be analysed in a similar manner to further develop and refine the argument on factors responsible for creating divergences in the regulatory arrangement of a country.

6. Conclusion

This paper puts together two different theories, i.e. Jordana. Levi-Faur & Marin's channel of institutional transfer and Mahoney & Thelen's gradual institutional change to identify relationship between the channels of transfer, institutional change and influence of IRAs in the resultant formal regulatory arrangement. The regulatory institutions, namely the IRAs, were considered to be the best practice measure that would help alleviate the governance issues especially in the developing economies were existing institutional arrangements were proving to be a hindrance for attracting capital investments specifically in infrastructure projects.

Persistence of the past problems even after introduction of IRAs attracted scholarly attention. The IRAs were studied to analyze their level of independence, autonomy, accountability, composition etc. However, as they were operating in a space where there was a pre-existing institutional set-up, it was necessary that IRAs be analyzed within that larger set-up.

Jordana & Sancho's (2004) work emphasized the need to study institutional constellations (entire set of formal institutions and interconnected rules that shape decision-making) arguing that the new institution of IRA is embedded into an institutional setting which would exert its influence. In analysis of Brazil's regulatory reform Prado (2012) suggested the need to study micro-design process in order to understand why institutional guarantee of independence in telecommunications and electricity sector were different. Her views were based on studies from Turkey, Egypt, Colombia and India, where she had observed influence of other actors such as bureaucracy, judiciary and politicians on institutional design (Prado 2012). González (2017) while measuring and comparing distribution of decision-making power in regulatory arrangement of telecommunucations sector across four Latin American countries observed variations not only at sector level but also at the level where regulatory issues were divided into economic, technical and social regulation (González 2017). Therefore, there is evidence on the need to study macro-level design as it matters. Before undertaking any major reforms across sectors, the existing dyanmics at both, micro and macro level, has to be understood especially if the objective is to bring convergence in regulatory philosophy. By analyzing the formal regulatory arrangememt and influence of IRAs, this paper contributres towards building such an understanding. It shows how isolated and piecemeal reforms initiated by different diffusion agents led to existing divergences.

This study also has clear limitations as it measures only the formal dimensions of regulatory arrangements. Nonetheless, it is important to undertake macro level analysis of formal regulatory arrangements. In the regulatory space resources are fragmented among the institutions involved such as the regulator, regulatees, state and non-state actors (civil society organizations) (Hancher and Moran 1998; Scott 2001). When resources are dispersed among actors, so will be the influence. To understand how regulatory governance is functioning on the ground level, it's important to find out the nature and extent of influence that institutions exercise over each other. However, to understand such de facto dispersion of influence (which in turn will enrich field of policy diffusion), one needs a point of reference i.e. formal dispersion of power among involved actors. This can be discovered by exploring how policy makers designed the regulatory governance on paper. Hence, it can be said that the analysis of formal

regulatory arrangement matters. This paper provides a basis for exploring de facto regulatory arrangements of these six sectors, and this could be one of the future research agenda. Such comparison of formal and de facto regulatory arrangements could throw interesting insights on the evolution of regulatory governance in both, the Global North as well as Global South, as it appears that both face a common set of challenges in current environment. It can also provide basis for exploring pros and cons of regulatory framework, its effectiveness etc.

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Annexure A – List of Abbreviations for Table 4

	1. Electricity sector
SERC	State Electricity Regulatory Commission
CERC	Central Electricity Regulatory Commission
CEA	Central Electricity Authority
	2. Telecom sector
DoT	Department of Telecom
TRAI	Telecom Regulatory Authority of India
USOFA	Universal Service Obligation Fund Administrator
	3. Aviation Sector
DGCA	Directorate General of Civil Aviation
MoCA	Ministry of Civil Aviation
AERA	Airports Economic Regulatory Authority
BCAS	Bureau of Civil Aviation Security
	4. Securities sector
SEBI	Securities and Exchange Board of India
	5. Groundwater (Maharashtra)
MWRRA	Maharashtra Water Resources Regulatory Authority
GoM	Government of Maharashtra
GSDA	Groundwater Surveys and Development Agency
WWRC	Watershed Water Resources Committee
CGWA	Central Ground Water Authority
	6. Groundwater (Uttar Pradesh)
DGWMC	District Ground Water Management Council
MWMC	Municipal Water Management Committee
GoUP	Govt. of Uttar Pradesh
GWD	Ground Water Department
GPGWSC	Gram Panchayat Ground Water Sub-Committee
BPGWMC	Block Panchayat Ground Water Management Committee
SGWMRC	State Ground Water Management and Regulatory Council

Annexure B

Administrative framework in India

The Constitution of India in Article 1 states that India shall be Union of States. Despite using the word 'Union of States' to describe the character of Indian state, the governance framework in India is not unitary. Alexandrowicz in his analysis, whether India is a federation or not, has stated that strictly looking through the rigid federal principles, India can't be classified as a federal state. Instead the exponents of federal principle such as K.C. Wheare have classified India as a quasi-federal state (Alexandrowicz, 2017). Even the Supreme Court of India, which has exclusive powers with respect to interpreting the Constitution, in numerous judgments (State of West Bengal vs. Union of India in 1964; State of Rajasthan vs. Union of India in 1978; State of Karnataka vs. Union of India in 1977 etc.) has characterized India as a quasi-federal state. Though India is a not a true federal state, there is division of power between the national and sub-national governments (henceforth referred to as Central government and State government respectively) which creates a multi-level governance framework.

In the multi-level governance framework of India there is a division of legislative functions between the Central and the State government. The Constitution of India (Part XI and Schedule VII) provides for three lists, namely, Union List, State List and Concurrent List which specifies who can make laws on which subject. In Part XI (which deals with legislative relations between the Union and the State) under Article 246 of the Constitution of India, the Central and the State government has exclusive power to legislate on matters enumerated in the Union List and State List, respectively. With respect to the Concurrent List both, the Central and the State government can enact laws, however in case there is an inconsistency between the laws made by the Central and the State government then to that extent of inconsistency, the law enacted by the former will prevail over the latter (Article 254 of the Constitution of India).

The division of legislative functions between the Central and State government can be better understood from the following illustrations. Posts and telegraphs (telephones, wireless, broadcasting and other like forms of communication) can be found in the Union List (entry 31 of the Union List). As the Central government has sole prerogative of making laws for items placed in the Union List, the telecom sector is regulated pan-India by the policies, laws, departments and agencies controlled by the Central government. Aviation, Banking, Insurance, Stock exchange & futures market etc. are examples of other items which can be found in the Union List (and where IRAs exist)

Water as an item can be found in both, the Union List (entry 56) and the State List (entry 17). However, it is the respective State governments who have the authority to formulate policies related to water supplies, irrigation, storage etc. The Central government usually assists with inter-state distribution of water. As the role of the State governments is central with respect to legislation of water sector, each State government enacts its own laws for regulating the water sector in their respective jurisdictions. The variations between state laws can be observed from the fact that out of 29 states, only 6 states have established an IRA for the water sector. This re-affirms exclusive power of each State government to make laws with respect to the items placed in the State List.

Electricity as an item can be found as an entry 38 in the Concurrent List where both the Central and the State government have the power to enact laws. In this instance the Central government has framed a national legislation which provides a framework for regulating the sector across the country and in accordance with the same each State government has enacted its own laws to regulate electricity sector in its jurisdiction. As Kale aptly puts it, the principle responsibility of Central government is to frame laws and that of State government is to implement them (Kale 2004). Further, the Central government has created Central Electricity Regulatory Commission (CERC) which governs inter-state generation and transmission of electricity. Each State government has created their own State Electricity Regulatory Commission (SERC) which regulates intra-state generation, transmission and distribution[13] of electricity.

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[13] Distribution of electricity is under the exclusive jurisdiction of each State government.

Annexure C

List of Primary and Secondary Legislations considered

S. No.	Sector	Primary Legislation	Secondary Legislation
1.	Electricity	• Electricity Act, 2003 along with amendments issued in 2007	• MERC (Conduct of Business) Regulations, 2004
2.	Telecommunication	• The Indian Telegraph Act, 1885 along with amendments issued in 1957, 1971 & 2003	• The Telecom Regulatory Authority Act of India, 1997 along with amendments issued in 2000 & 2014 • Indian Telegraph (Amendment) Rules, 2004 • The Indian Wireless Telegraphy Act, 1993
3.	Aviation	• The Aircraft Act, 1934 along with amendments issued in 1936, 1938, 1939, 1944, 1948, 1960, 1972, 1983, 1985, 1988, 2000, 2007	• The Airports Authority of India Act, 1994 along with amendment issued in 2003 • The Airports Economic Regulatory Authority of India Act, 2008 along with amendment issued in 2019 • Aircraft Rules, 1937 • Aircraft Security Rules, 2011
4.	Securities	• Securities Contracts (Regulation) Act, 1956 along with amendments issued in 1995, 1999, 2004	•
5.	Groundwater MH	• Maharashtra Groundwater (Development & Management) Act, 2009	

6.	Groundwater UP	• The Uttar Pradesh Ground Water (Management and Regulation) Bill, 2017	

Equations used in calculation of indices: Source (Mathieu et. al 2016)

Equations	Variables	Description
$$C_o = \frac{\sum_{j=1}^{i} a_j - 1}{i(a-1)}$$	a	Number of actors in the regulatory arrangement
	i	Number of issues in the regulatory arrangement
	Co	Coordination Index
$$AI(A_k) = \frac{\sum_{j=1}^{i} AI(A_k I_j)}{i}$$	aj	Number of actors involved in the decision over the issue number j
	AI	Actor Influence Index
	AI(AK)	Actor Influence of Actor number k on the whole regulatory arrangement
$$C_C = \frac{\sum_{k=1}^{i}[AI(A_{max} - AI(A_k)]}{a-1}$$	AI(AkIj)	Actor Influence of Actor number k on the issue number j
	Cc	Concentration Index
	AI(Amax)	Actor Influence of most influent actor of the regulatory arrangement