Institutional Innovation Diffusion in Brazil: Public Consortia in Metropolitan Regions

Paper prepared to present in the 3rd International Conference on Public Policy (ICPP 3)
Pannel 36 (P36) - Innovation, Governance and Reform: Lessons from the Developing World

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Singapore, 26th to 30th June 2017

1. INTRODUCTION

Since its origin and more sharply after the constitution of 1988, which enshrined the Municipalist Federalism, Metropolitan Regions (MRs) in Brazil, have difficulties producing collective cooperative actions (Garson, 2009). Therefore, the municipalities use institutional mechanisms to implement its public policies, such as the Intermunicipal consortia, which are institutions through which the municipal political actors decide to cooperate with others to solve problems of common interest and in specific areas, with the aim to meet local demands (ABRÚCIO; SOARES, 2001; CRUZ, 2002; CALDAS, 2007; NASCIMENTO E FERNANDES, 2015, CASTELLANO, 2007; CUNHA, 2004; CRUZ, 2002, STRELEC E FONSECA, 2011).

The promulgation of the Consortia Law in 2005, consecrated this modality that has spread among the most diverse locations in Brazil. In metropolitan areas, the consortia have been shown to be an alternative for the implementation of public policies. The intermunicipal consortia are considered as an innovation in the form of intergovernmental relationships in Brazil and the goal of this article is to demonstrate the aspects that led to their spread. For the demonstration of the factors that explain this diffusion two of the categories of the theory of diffusion proposed by Rogers (2003) were used. It is intended in this article to identify the spread of consortia in metropolitan regions categorized by characterization of the municipalities of the consortium, emphasizing the public policy implemented within the consortium, in their criteria of compatibility and complexity. It was used the statistical technique of logistic regression for obtaining evidence to justify the decision to join the public consortia by municipalities. Therefore, the dependent variable is the existence of a consortium in the municipality, and as independent variables secondary data that characterize the municipalities of the consortium.

The intermunicipal consortia inserted in metropolitan regions, have relative success and brought cooperation to the intermunicipal relationship within some of the largest metropolitan regions of Brazil, as is the case of consortia in the areas of health and treatment of solid waste. In the area of health, the consortium in metropolitan regions was fundamental so that the small-sized municipalities of RMs could join the *Health Unic System* (SUS) and in the area of treatment of solid waste was important for the construction of landfills to end the dumps. And this is the object that the text will work, the dissemination of Intermunicipal consortia in the areas of health and treatment of solid waste in metropolitan regions.

The text is structured into 8 sections, more this introduction and a section of conclusions. In section 2, we will present the characteristics of the so-called Brazilian municipalist federalism which becomes without no incentives to intermunicipal cooperation action in MRs. Section 3 deals with a general approach on the intermunicipal consortia in Brazil, being highlighted the time of Law of consortia - Law 11.107/2005. Section 4 mentions the metropolitan context in Brazil and the difficulty of intermunicipal cooperation. Section 5 will

discuss the importance of the creation of the Intermunicipal consortia in metropolitan regions. Section 6 deals with a quick review of the theory of diffusion and talks about the seminal concept of Rogers with his categories of analysis. Section 7 presents the methodological procedures of labor and the section 8 brings the results obtained with the analysis.

2. THE MUNICIPALIST BRAZILIAN FEDERALISM

One of the biggest problems faced in the Brazilian Federation is the municipal autonomy vis-à-vis the low fiscal capacity, financial and institutional of municipalities to absorb and give an account of all their constitutional functions, including urban policy (ABRUCIO, 2005; ALMEIDA, 2005). The low financial capacity of Brazilian municipalities occurs even with the sharing of federal and state taxes that are passed to these, as well as constitutional transfers associated to implementation of social policies, especially in the areas of health and education.

In 2010, according to IBGE Census Brazil had 5,565 municipalities. The majority of Brazilian municipalities accumulates a series of problems, especially with regard to the execution of their duties of constitutional social policies and also of urban policy. One of the problems that leads to this reality is that the majority of Brazilian municipalities has low capacity and rely almost exclusively on intergovernmental transfers as source of resources. As Fernandes and Wilson (2013, p. 18) consider, with the redistribution of the Federal tributary load originated from the Constitution of 1988, the small municipalities have experienced a situation in which they could enjoy political autonomy even with financial dependence of transfers and almost no force of tax collections. Of course that at the end this initial stimulation will seem in the long term, a zero sum game, because municipalities do not have capacity only with transfers and low tributary capacity to maintain its constitutional functions, including the social policies and urban policy

Therefore, the municipalist Brazilian federalism brings a situation of zero sum game which is characterized in the budget and tax limitation, and rigidity in expenditure, mainly in the cities of small size, dependent on the directory of intergovernmental transfers, characterizing them as autonomous municipalities, but virtually no autonomy to invest, and independent federal entities, despite of such dependence of the FPM[1] and other resources originated from transfers.

[1] Participation Municipal Fund (FPM), is compose of, 25% of the state tax on operations related to the movement of goods and services (ICMS); 50% of the state property tax on motor vehicles (IPVA); 50% of the union tax on rural land ownership (ITR); 70% of the Union tax on credit, foreign exchange, insurance or securities transactions involving gold (IOF-gold). The total resources of the FPM are segmented into three parts: 10% are delivered to municipalities that are city capitals, 86.4% to non-capital cities and 3.6% constitute a reserve to supplement the participation of the most populous municipalities in hinterland with more than 156,216 inhabitants, according to Decree-Law number 1,881/1981. To calculate the FPM, participation rates published annually by the Court of Auditors of the Union (TCU) are used.

Another point quite discussed in Brazilian federalism is the competitiveness gained by municipalities after becoming federal entities, and their limited capacity, or institutional incentives, to become cooperative. Therefore, the criticism to the "institutional legal framework of federalism has been shown to be inadequate to deal with the inter and intra-regional inequality (Garson, 2009, p. 21), and this process of federative decentralization was not accompanied by the development of institutions that would stimulate cooperation among the federation entities.

The understanding of the diffusion of Intermunicipal consortia in Metropolitan Regions has as an important point the understanding that the Brazilian federalism with municipal autonomy stimulates little cooperation among the municipal entities, these loaded with responsibilities on public policies, especially the social policies being highlighting therein, health and education. Hence the existence of institutional innovations that encourage the intermunicipal aggregation to be fundamental. However, the “management of the metropolitan question, with all its ambivalences and paradoxes, becomes dependent, fundamentally, with the cooperation of municipal entities little stimulated to the establishment of cooperative solutions and little accustomed to such practices" (BALBIM ET AL, 2011, p. 173).

3. INTERMUNICIPAL CONSORTIA IN BRAZIL

The Law of Public Consortia - Law 11.107/2005, had its origin in Article 23 from the Constitution of 1988, with estimates of complementary law to discipline instruments of cooperation and federative coordination. The Constitutional Amendment no. 19/1998 allowed the public consortia could be disciplined by means of ordinary law and not complementary. The dissemination of intermunicipal consortia showed that even with all the financial and budgetary and administrative limitations, municipalities were able to cross their administrative boundaries and interconnect with each other in order to resolve common problems. The intermunicipal consortia, therefore, are centrally placed in the debate about the problems of inter-federative coordination in Brazil.

In general lines, the intermunicipal consortia are cooperation partnerships among two or more municipal entities of the federation, who compromise to execute a specific demand or a particular undertaking, or the provision of a sectorial service (BITTENCOURT, 2011, p. 66). By means of consortia, several municipalities solve common problems by defining, together, policies, and programs. Among the most common are issues associated with the environment, infrastructure and constructions, Health - This latter type of consortium presents the greatest number of consortia established in Brazil. The municipalities join voluntarily according to common interests and remain if they wish so, even when there is a political-party change in the management of Municipal Government.

In spite of the intermunicipal consortia represent an element of effective and democratic management, in the search for solutions that go beyond the territorial limits of the municipalities, within the metropolitan context it can be a useful tool, especially supposedly as regards the possibility of already finding institutionally relations of intermunicipal aggregation and a metropolitan region, given that cities that make up the RM, can now be legally sharing urban services, such as transportation, urban sanitation and solid waste treatment .

At the next section the nature of the metropolitan context in Brazil will be discussed and how the Metropolitan Regions, despite of having more recently a wide spread, and from 2015 to be supported by the force of law - the metropolis by-laws, ended up not translating into intermunicipal aggregations able to create organization mechanisms and provision of services regulation, both as it was the case of the Intermunicipal partnerships in Brazil.

4. THE METROPOLITAN CONTEXT IN BRAZIL

In Brazil, regarding the creation of metropolitan regions, the Constitution (paragraph 3 of article 25) leaves this prerogative responsibility to the states, which is realized by the approval of complementary state law. From the second half of 1990, it was observed the creation of large number of metropolitan regions by state governments. There are nowadays in the country today 74 metropolitan regions and 3 Regions of Economic Development (RIDES) - involving 1144 municipalities - with varied characteristics and without observance of consistent criteria as to the population, the degree of urbanization and the centrality which should characterize these regional units. The Federal Government over the decades has left without regulation the issue of metropolitan management in Brazil. In the National Congress, the consensus seemed to be the need to establish parameters for the creation of metropolitan regions and other urban agglomerations by the states (FERNANDES, ARAUJO, 2015).

Starting in 2012, the National Congress initiated the organization of debates focused on the construction of the Metropolis by-laws, that at the end of 2013, was approved by the House of Representatives after by the Federal Senate, and in December 2014 it was submitted to the presidential approval, generating the Law n 13.089/2015 - the Metropolis by-laws. The new law has as main characteristics: (I) Fixed minimum aspects to be defined by the complementary state laws that establish metropolitan areas and urban agglomerations; II) it sets out principles to be respected in the federal governance, among which the prevalence of common interest on the location and the sharing of responsibilities for the promotion of integrated urban development are highlighted (III) it sets guidelines related to federal governance which include: deployment of permanent and shared process for planning and decision-making with regard to urban development and sectoral policies related to the public functions of common interest; establishment of the shared means of administrative organization of public functions of common interest; shared execution of the public functions

of common interest, upon apportionment of costs previously agreed upon In the context of the governance structure of federalism; IV) it requires the development of urban development planning, integrated metropolitan region or urban agglomeration, regardless of the master municipal plan, as an instrument of federal governance; V) it sets conditions for the support of the Union for initiatives by states and municipalities aimed at federal governance in metropolitan areas and urban agglomerations (FERNANDES; ARAÚJO, 2015).

In spite of the metropolitan regions have in the current context a legal treatment, as it was observed not a long time ago, “they are not constituted in the practice as a valid instrument to take care of the urgent demands of the metropolises increasingly socially fragmented" (CASTRO, 2006, p. 144) and therefore still, "the metropolitan municipalities keep on working in an autarchic manner and without any instance of coordination" (Garson, 2009, p. 197). But, in spite of practically all discussions turn to mainly for the weaknesses of the RMs, - such as the tributary and budgetary differences of the main cities and the other municipalities, the budgetary rigidity , the lack of coordination instruments or even coercion of the states of the federation to manage or even organize the RMs and the lack of political legitimacy of the RMs - still, the country has seen a boom in creation of RMs in the states, through complementary laws, especially in the last 17 years, starting in the year 2000, as shown in table 1 below. Out of the 1144 existent Metropolitan Regions, 771 of them, that is 67% out of the were created between 200 up to now.

Table 1 - Metropolitan Regions (RMs) created between 1970 and 2010 and number of cities included in the RMs (per decade)

Decades	Number of RMs	Quantity of municipalities contained in the RMs
Decade of 1970.	9	176
Decade of 1990.	13	197
Decade of 2000.	14	138
Decade of 2010*.	38	633
Total	**74**	**1144**

*Until January 2016.
Source: Elaborated by the Authors[2]

Many Metropolitan Regions introduced in the last 17 years, not necessarily resulted in the creation of structures able to regulate or organize the provision of urban services, or of social policies. As Garson (2009) states, the municipalities of the metropolitan regions being excluded those which are central nucleus and or state capitals, have low capacity of municipal

[2]In this work a count of the existing RMs was made from information obtained in legislative assemblies of 27 Brazilian states plus the Federal District. This was carried out because in Brazil the data about the total of existent metropolitan regions is very inaccurate. The only existing study which gives an account of this is the network of Influence of Cities (REGIC) of IBGE conducted in 2008, which, therefore, is outdated.

investment. This makes the intermunicipal cooperation difficult, but also the absence of formation of institutional arrangements as well as the establishment of metropolitan funds to perform investment in infrastructure constructions and provision of urban services such as transport and urban cleaning contribute to this.

However, the intermunicipal consortia created in metropolitan regions, unlike the Metropolitan Regions themselves that were instituted, brought a new element in relation to the intermunicipal metropolitan cooperation. And this was due to the own characteristics of consortia - spontaneous adhesion of the municipalities, specific interest in providing a service and due to this, a more participatory character and therefore, aggregator. The consortia were able to stimulate the intermunicipal cooperation in metropolitan regions, hence its wide dissemination in the past 12 years.

5. THE INTERMUNICIPAL CONSORTIA IN METROPOLITAN REGIONS

The intermunicipal consortia have different characteristics of the metropolitan regions. Firstly, consortia are created by spontaneous adhesion of municipalities to solve specific problems, which involve a specific region, uniting in the same geographical area municipalities with specific and similar interests. On the other hand, the metropolitan regions are created by the force of law of state governments, which add a set of municipalities that mandatorily take part of such RM. In addition to the provision of specific services, it has the competence to develop the metropolitan planning.

When discussing the metropolitan regions, it is known that the social, economic and environmental problems gain prominence in small-sized cities. In other words, Intermunicipal consortia and Metropolitan regions are placed in a similar way in the debate about the inter-municipal aggregation, when in fact they are distinct objects in public management. Intermunicipal consortia and metropolitan regions have gain mechanisms when it comes to the cooperation which are very different. The intermunicipal consortium is not an instrument necessarily metropolitan, because it is applicable to any situations where the common action between the municipal public power is necessary (BITTENCOURT, 2011, p. 66), they end up assuming a regional character which is not exactly metropolitan.

Before the arguments posted up to now we bring back the issue of labor, that the intermunicipal consortia in Metropolitan regions can produce intermunicipal cooperation that the institutionalization of the metropolitan region alone is not capable and much less stimulate it. However, the intermunicipal consortia inserted in metropolitan regions, have relative success and brought cooperation to the intermunicipal relationship within some of the largest metropolitan regions of Brazil, as is the case of consortia in the areas of health and treatment of solid waste.

6. THE DIFFUSION OF PUBLIC POLICIES AND THE CATEGORIES USED IN THE STUDY

The central issue in studies of dissemination of public policies is to understand the reasons for the adoption of the governments by given innovative public policies. It is a field which is still under construction and there is little consensus about the phenomenon. The small amount of research and explanatory models on local innovations is a large gap in the literature that needs to be completed (COELHO, 2010). As stated by Faria (2012: 337) "the processes of diffusion/transfer of public policies, even being increasingly intense, are still little studied in Brazil (and also in Latin America)." Works like those of Sugiyama (2008) and Coelho (2008) that analyze the spread of *Bolsa Família* Program in the major cities of Brazil, fills a gap in the literature for the dissemination of public policies in the country.

Even though the governments are independent in the sense that they take their own decisions without cooperation or coercion, but are interdependent in the sense that they influence the decisions of other governments (GONNET, 2015), and by diffusion is a process of adoption of a given public policy (PORTO DE OLIVEIRA, 2015). It is the adoption by governments of similar innovative programs, in a non-coordinated way, but interconnected (ELKINS, 2003, apud WAMPLER, 2008), also called "standardization" that happens in the early stages of the trajectories of dissemination (MILHORANCE, 2013).

Oliveira (2015: 4-5) states that "the diffusion, dissemination, *lesson-drawing*, transfer and *policy bandwagoning* are some of the concepts used to refer to the process of creating a public policy on the basis of another public policy already existent". Basically two types of diffusion of policies are examined: horizontal and vertical. The vertical spread is verified "between central and municipal level of government, the political incentives are analyzed based on the competition for resources from the federal budget" (COELHO, 2012), the so-called top-down. Whereas the horizontal spread is analyzed from the point of view of competition at the same level of government, in case municipal or state, when referring to a survey in a country, and in this case it is taken into account the political incentives to gain competitiveness.

There are two argumentative bases to explain the adoption of public policies, in the context of the discussion on sub-National North American dissemination, according to Wampler (2008). First of all, there are the internal determinants, such as income, election results and government spending, and after the networks of public policies, such as external determinants, which are characterized by good ideas, in addition to its geographical boundaries, which the rulers seek to deploy in their governments. Wampler (2008: 71) includes still a third explanation, "that bonds the two previous explanations, regarding the active promotion of a specific policy by a political party", which would be more in the ideological vision,

such as the one that asserts that the center-left parties are more likely to implement social programs (Sugiyama, 2008).

The first analysts for the dissemination of public policies were Walker (1969) and Collier and Messick (1975). These studies consider among other elements that the spread of policies could not simply examine “prerequisite” explanations, or of internal orders, but also include variables from external orders, such as the spatial proximity.

In a brief discussion on the theory of diffusion, the central issue addressed by scholars who research the emergence and the widespread adoption of public policies is to provide explanations about the factors that influence the political behavior of the executive. In a political federalized system, subnational governments have constitutional prerogatives to create and/or copy policies from of other governments. In a globalized world and more recently interconnected, the spreading of ideas and solutions have brought closer political actors in the same government sphere. The point of interest behind these events that mobilize social and institutional public and strategies is to test how far the political behavior of rulers is strongly influenced by the "fashion" or "diffusion waves". It is understood hence that the provision of policies begins to be directed based on previous decisions from other governments and not by the government program presented to society.

The field of study of dissemination policy is eminently empirical, despite of having consistent theoretical foundation to support future studies, but part of today’s theory of today was born precisely of empirical research. It is consolidated and grows as an area of public policy analysis testing and creating new theories and/or models by means of empirical findings.

In the work herein it will be used the concept of diffusion of innovation by Rogers (2003) to deal with the intermunicipal consortia. It is considered here as presented in the introduction that the intermunicipal consortia and specifically the intermunicipal consortia in metropolitan regions are innovative mechanisms capable of stimulating inter-municipal cooperation. The dissemination of consortia based on some categories of the diffusion concept by Rogers, will be in the areas of Health and Management/treatment of Solid Waste (construction and operation of landfills).

Some of the categories that define dissemination of public policies set out by Rogers (2003) will be used in this study, which identified five attributes for the diffusion of innovation, which are: relative advantage, compatibility, complexity, feasibility and observability. In his work, Diffusion of Innovations (2003: 5), originally published in 1962, Rogers defines the concept of diffusion: "Diffusion is the process by which an innovation is communicated through certain channels during a certain time, among the members of a social system ". Rogers (2003) presents the phenomenon of innovation as something systemic privileging the epistemological aspects and technological innovations, the form how innovation is processed by the people and the social groups (and its effects), and how organizations conduct the innovations. In the

section "Elements of dissemination", it focuses on the basic process as the diffusion of innovation in organizations and governments. In this part, it is presented what he considers the attributes of innovations that are: 1. Relative Advantage obtained by adopting an innovation; 2. Compatibility with values; 3. Complexity to adopt the innovation; 4. Viability - the-learning possibility and the gradual use of novelty and 5. Observability- i.e., the extent to which the results are visible.

At the work herein we used two of these categories to analyze the diffusion of intermunicipal consortia in metropolitan regions: Compatibility and complexity. In compatibility, the internal characteristics of municipalities will be analyzed and their likelihood to form consortia. When it comes to complexity, the formation of consortia was analyzed before and after the law of consortia in 2005. The categories relative advantage, Feasibility and observability were not explored due to the difficulty measuring before the statistical model used at work.

7. METHODOLOGICAL PROCEDURES

The article uses two dimensions of the five proposed by Rogers, being operated in three steps. At first, it was worked to understand the dimension of "complexity", by means of historical series of formation of consortium - 1992 2016. At the second step a logistic regression model was used to understand the dimension of "Compatibility", i.e., the internal characteristics of the municipalities and the odds ratio for each variable involved in the model.

The sample used comprised the totality of metropolitan municipalities which affiliated to consortia in health and in management of solid waste, after the withdrawal of municipalities with lack of information. Out of a universe of 1.144 metropolitan municipalities, a sample of 1,057 municipalities affiliated to consortia was used in health areas and 1072 municipalities affiliated in consortia in solid waste management, after the withdrawal respectively in each area of those municipalities that did not have records of information in the database.

The bases of research used to reach these numbers were: Profile of Brazilian Municipalities in 2015, in IBGE (2016); Atlas of Human Development in Brazil, in PNUD, FJP, IPEA (2013); electoral results of TSE, in Brazil (2016); Finance data in Brazil FINBRA, in Brasil (2017i).

In the stage of the research that the logistic regression was used, the dependent variable was called Cons_SaúdeY (in the case of the health area) and Cons_ResSolY (in the case of solid waste), and 0 for the metropolitan municipalities not affiliated to consortia in health or in solid waste management, and 1 for those who participated in inter-municipal consortia of health or solid waste management. Below is the table with the description of independent variables:

Chart 1 - Description and identification of variables

Description of the variable	Identification of the variable
lnTransfSUSTotal	The amount of revenues Intergovernmental transfer from Health Fund to fund (Union, State and Municipality)
TransfInterRecProp	The percentage of transfers between governments on Total Tax Revenues
IDHM	Municipal Human Development Index 2010
PopBruta	Total Municipal Population in 2010
PibMunic	Municipal Gross Product 2010
AlternPart	Number of political changes in the position of municipal mayors from 2004 to 2016
nMunicRM	Number of municipalities in the Metropolitan Region
lnRecTributaria	Log of Municipal Tax Revenue
FuncAdmDireta	Number of direct administration employees of the Municipalities
lnDespCorrentes	Log of Municipal current expenditures
Capital	(Categorical) to be or not the state capital
IndiceGini	(Categorical) or may not be the state capital
GiniPIB	Interaction between the Gini Index and GDP

Source: Elaborated by the authors

Chart 2 - Work's hypothesis

Step 1 (E1) – Complexity		
Hypothesis		
(H1) with the law of consortia in 2005, the Public consortia of Health and treatment of solid waste are spread throughout the country.		
Step 2 (E2) - Compatibility (logistic regression)		
Dependent Variable: - Binary - being or not affiliated to Health consortium		
Hypothesis	Signal	Independent Variables
(H2) the higher the Human Development Indexes (IDHM), the smaller the probability to affiliate to consortium.	(-)	IDHM
(H3) the population size or its condition of state capital influences the possibility to affiliate to consortium.	(+)	population; Capital
(H4) the higher the social inequality, the lower the probability to affiliate to consortium.	(-)	The Gini Index
(H5) the economic power of the region can influence the probability of affiliating to a consortium.	(+)	Municipal GDP
(H6) the influence of GDP of Municipalities of these regions decreases as the social inequalities increase.	(-/+)	PIBMunic + the Gini index
(H7) political changes of the people who are in charge of the city hall can decrease the likelihood of affiliating to consortium.	(-)	Political party change
(H8) the number of municipalities of MRs can promote an increase in the probability of affiliating to consortium.	(+)	Num. Metropolitan municipalities
(H9) The higher the tributary capacity, the higher the possibility to affiliate to consortium.	(+)	(ln)Rec. Tributary
(H10) the greater the number of direct administration employees, requires greater technical capacity of the municipality, and the greater the chances to affiliate to consortium	(+)	Direct Administration Employee
(H11) the higher the levels of public current expenditures, the greater the indebtedness, and the lower the chances to affiliate	-/+	Current Expenditures

to consortium, but from a given limit of debt, the likelihood of the municipalities to affiliated increases.		
(H12) The higher Health Unic System (SUS) resources transfers - fund to fund - the higher the expenditures in this health area, and the higher the chances to affiliated to consortium.	(+)	SUS Transfer

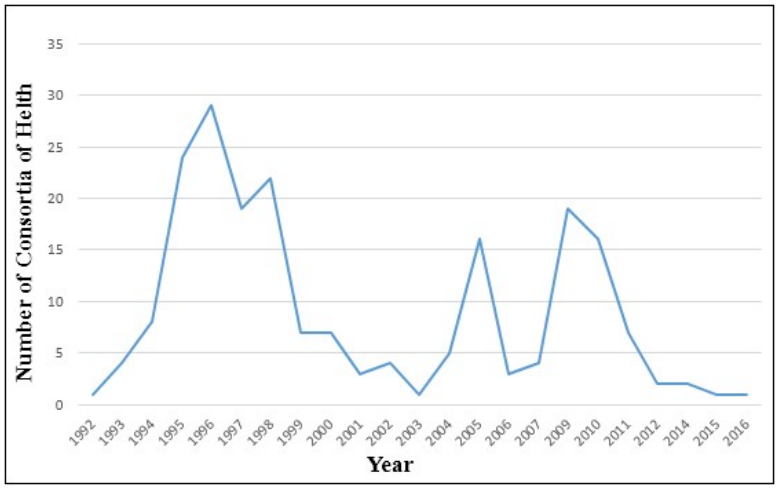
Source: Elaborated by the authors

8. RESULTS

8.1. Intermunicipal consortia of Health

In the first stage of the research regarding the municipal consortia of health, the historical series contained in graph 1 shows the number of intermunicipal health consortia registered in Brazil per year, between 1992 to 2016 (OCPF, 2016). And in such graphic it is possible to realize that the hypothesis H1 is rejected, i.e., the longest period of dissemination of health intermunicipal consortia occurred between the years from 1992 to 1998, before, therefore, the Law of consortia. This occurs as a result of SUS regulation- Law 8080/90 (article 10)[3], where there is the prediction of consortium affiliation among municipalities aiming at actions and provision of health services. After the Law of consortia there was also a process of consortia dissemination of health, but in much lesser number than occurred between the period between 1992 and 1998.

Grafic 1: Number of Consortia of Health per Year (1992 - 2012)



Source: Elaborated by the authors

In the second stage of the research, the results showed the characteristics of municipalities and their degree of compatibility with the adoption of consortia. The higher the probability of affiliating to consortium, the greater is the degree of compatibility among these municipalities and the public health consortia.

[3]Law 8080/90 in its Article 10: "Article. 10 - The municipalities can set up consortia to jointly develop the actions and health services that will match to their needs"

The ft-in tests of the models were classified correctly, that is, in general the five models predict 70% of the data classified correctly. Furthermore, in all five models the LR chi2(9) showed results above 250.00, i.e., variables are jointly significant to explain the models. And the Prob>chi2 (0.0000), indicates that it is possible to reject 1% the hypothesis that all the coefficients are equal to zero.

Table 2 – Logistic Regression

VARIABLES	(1) Cons_SaudeY	(2) Cons_SaudeY	(3) Cons_SaudeY	(4) Cons_SaudeY	(5) Cons_SaudeY
lnTransfSUSTotal	0.0910	0.0712	0.0473	0.121	0.121
	(0.150)	(0.149)	(0.147)	(0.151)	(0.151)
TransfInterRecProp	1.54e-09	1.61e-09	1.60e-09	1.71e-09	1.70e-09
	(1.29e-09)	(1.23e-09)	(9.99e-10)	(1.25e-09)	(1.24e-09)
IDHM	10.73***	52.89***	11.27***	9.369***	9.370***
	(1.552)	(18.70)	(1.582)	(1.599)	(1.599)
IDHM2		-31.52**			
		(13.89)			
PopBruta	-1.83e-06	-2.09e-06*		-1.85e-06	-1.87e-06
	(1.31e-06)	(1.27e-06)		(1.28e-06)	(1.30e-06)
PibMunic	1.36e-09	9.02e-09	-3.16e-08	-8.91e-10	-8.31e-09
	(2.56e-08)	(2.03e-08)	(2.16e-08)	(2.31e-08)	(1.05e-07)
AlternPart	0.152	0.145	0.143	0.180	0.180
	(0.135)	(0.135)	(0.136)	(0.136)	(0.136)
nMunicRM	0.0547***	0.0539***	0.0521***	0.0533***	0.0533***
	(0.00782)	(0.00780)	(0.00782)	(0.00779)	(0.00782)
lnRecTributaria	-0.267**	-0.318**	-0.290**	-0.284**	-0.286**
	(0.133)	(0.136)	(0.134)	(0.135)	(0.136)
FuncAdmDireta	-3.95e-05	-4.63e-05	-1.96e-06	-3.26e-05	-3.19e-05
	(5.30e-05)	(5.07e-05)	(5.47e-05)	(5.21e-05)	(5.27e-05)
lnDespCorrentes	-0.109	0.0266	-0.112	-0.0642	-0.0598
	(0.268)	(0.275)	(0.266)	(0.271)	(0.278)
capital			-2.944***		
			(1.063)		
IndiceGini				-4.790***	-4.816***
				(1.299)	(1.348)
GiniPIB					1.28e-08
					(1.75e-07)
Constant	-4.137*	-19.33***	-3.479	-1.935	-1.982
	(2.274)	(7.106)	(2.297)	(2.364)	(2.448)
LR chi2(10)	257.13	253.87	250.01	252.50	251.04
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Correctly classified	71.81%	71.24%	71.62%	71.33%	71.24%
Observations	1,057	1,057	1,057	1,057	1,057

Standard errors in parentheses / *** p<0.01, ** p<0.05, * p<0.1

Table 3 – odds ratio of the Independent Varibles

VARIABLES	(1) Odds Ratio	(2) Odds Ratio	(3) Odds Ratio	(4) Odds Ratio	(5) Odds Ratio
IDHM	41,486***	1.749e+24***	71,077***	10,896***	10,894***
	(65,256)	(3.402e+25)	(113,639)	(17,643)	(17,646)
IDHM²		0**			

		(0)			
nMunicRM	1.057***	1.057***	1.055***	1.056***	1.056***
	(0.00828)	(0.00828)	(0.00828)	(0.00825)	(0.00830)
lnRecTributaria	0.756*	0.673**	0.733**	0.743*	0.743*
	(0.115)	(0.110)	(0.113)	(0.115)	(0.116)
capital			0.0938***		
			(0.0859)		
IndiceGini				0.00912***	0.00913***
				(0.0118)	(0.0122)

seEform in parentheses / *** p<0.01, ** p<0.05, * p<0.1

The results showed the degree of compatibility of municipalities with the probability of the metropolitan municipalities to affiliate in health consortia. For the hypothesis (H2), the IDHM showed high significance and likelihood of chance (above 1). Therefore, it contradicts the hypothesis that municipalities with low IDHM adhere more to consortia. However, the IDHM² (IDHM squared) indicates that when the IDHM increases and reaches a specified point begins to act negatively in the formation of consortia, thus, cities with high levels of IDHM tend not to affiliate to consortia.

The population size was low compared with the consortia, but the fact that the municipality is the capital of the state (H3) should be better investigated, because in general, the capitals have low adherence to health consortia and are significant in explaining the likelihood to affiliate to consortia. However, the low odds ratio indicates that this variable is more related to the group of municipalities not affiliated to consortia. Certainly the cases of capitals affiliated to consortia fit in as outliers of the model. The database indicates that only Belo Horizonte (BH) and Porto Alegre (RS) are part of a health consortium, among the capitals.

The rates of municipal GDP showed no statistical significance in the model, which shows that both, municipalities with high rates and low rates can affiliate to consortia(H5). This was proved when associating the municipal GDP to indices of Gini (H6). However, the Gini Index, isolated, has significance in model (5), with the negative sense. In other words, cities with high concentration of income tend not to affiliate to consortia, and municipalities with low concentration of income tend to affiliate to consortia(H4). Due to being close to zero, the odds ratio in the Gini Index is more closely associated with not affiliated to consortia municipalities.

The data also indicate that political party change (H7), number of direct administration employees (H10) and current expenditures (H11) do not have association with the formation of consortia. However, the meanings of each variable can be analyzed.

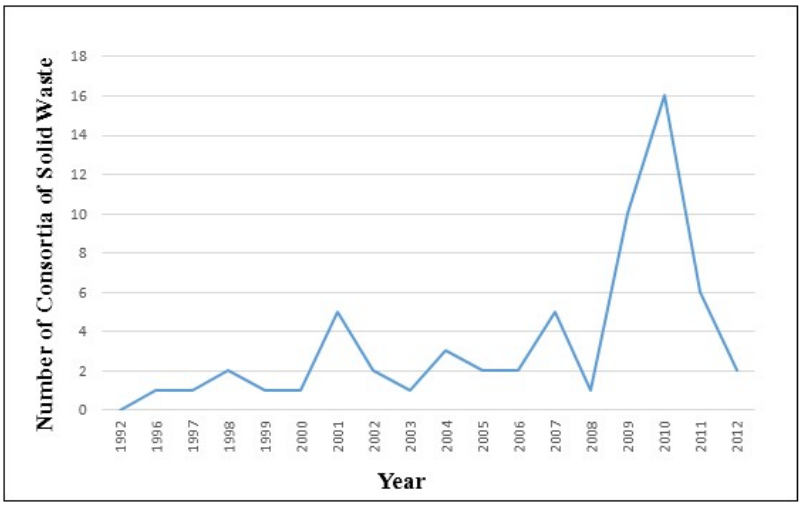
Two variable deserve significance highlight. One is the number of municipalities in the Metropolitan Region; data showed equal senses, therefore it is realized that the larger the size of the RM the greater the chances to affiliate to consortia. The probability associated to this variable is 100%, i.e., directly related to the municipalities that affiliated to consortia (H8).

Another variable was taxation capacity, through the volume of tax revenues. The survey showed that the lower the taxation capacity, the greater the chances of affiliate to consortia, in an odds ratio of 70%. In other words, municipalities that do not have the financial capacity find in consortia an opportunity to implement better health services (H9). Whereas SUS transfers conditioned and total (resulting from Union and States) were not significant for the adhesion to health consortia (H12).

8.2. Intermunicipal Consortia of Solid wastes management

In the first stage of the research related to municipal consortia of solid waste management, the historical series contained in the graph 2 shows the number of intermunicipal health consortia registered in Brazil per year between 1992 to 2012 (there are no records in the database observatory of the Center of Consortia Training – OCPF, about consortia of solid wastes after the year 2012). In the same way as happened in the area of health, the hypothesis H1 is rejected, i.e., the longest period of dissemination of intermunicipal consortia of solid wastes management does not occur immediately after the creation of the law of consortia, but more recently, from 2010 on. This is due to the approval in 2010 of the Law of the National Solid Waste Policy - Law 12.305/2010, which determines that all landfills in the country should be closed until August 2nd 2014 and disposals (what cannot be recycled or reused) forwarded to adequate sanitary landfills. This deadline was reset to 2018 from the Draft Law 2289/2015 of the Senate that is progress in the Congress at this moment[4].

Grafic 2: Number of Public Consortia of Solid Wastes per year (1992 - 2012)



Source: Elaborated by the Authors

[4]The Draft Law 2289/2015, which was approved in the Senate and in progress at the Congress, gives a period until July 31st 2018, for capital cities and metropolitan regions to suit.

In the second stage of the research for this type of consortium, the results showed some differences regarding the results pertaining to the municipalities affiliated in health consortia. The higher the probability of affiliating to consortium, the greater is the degree of compatibility among these municipalities and the public solid wastes management consortia.

The fit-in tests of the models classified correctly in all five models to approximately 79% in general. Furthermore, in all five models the LR chi2(9) showed results around 40.00, i.e., variables are jointly significant to explain the models. And the Prob>chi2 (0.0000), indicates that it is possible to reject 1% the hypothesis that all the coefficients are equal to zero.

Table 4 – Logistic Regression

VARIABLES	(1) Cons_ResSolY	(2) Cons_ResSolY	(3) Cons_ResSolY	(4) Cons_ResSolY	(5) Cons_ResSolY
TransfInterRecProp	-0.866	0.151	-0.955	-0.839	-0.742
	(1.214)	(1.330)	(1.208)	(1.220)	(1.236)
IDHM	-2.865*	-56.62***	-2.889*	-3.842**	-3.985**
	(1.606)	(18.42)	(1.612)	(1.688)	(1.695)
IDHM2		40.72***			
		(13.89)			
PopBruta	-9.12e-07	-6.43e-07		-8.22e-07	-2.66e-07
	(9.41e-07)	(9.18e-07)		(9.80e-07)	(9.68e-07)
PibMunic	3.06e-08	2.28e-08	1.76e-08	2.87e-08	2.16e-07*
	(1.87e-08)	(1.90e-08)	(1.40e-08)	(1.90e-08)	(1.16e-07)
AlternPart	-0.0602	-0.0553	-0.0541	-0.0448	-0.0398
	(0.147)	(0.148)	(0.147)	(0.148)	(0.148)
nMunicRM	0.00163	0.00101	0.00164	0.000880	-0.000665
	(0.00786)	(0.00790)	(0.00788)	(0.00795)	(0.00803)
lnRecTributaria	-0.435***	-0.307*	-0.435***	-0.454***	-0.414**
	(0.161)	(0.170)	(0.161)	(0.163)	(0.164)
FuncAdmDireta	-8.23e-05	-7.25e-05	-9.38e-05	-7.80e-05	-0.000112*
	(6.16e-05)	(5.92e-05)	(6.05e-05)	(6.27e-05)	(6.75e-05)
lnDespCorrentes	0.754***	0.565**	0.736***	0.825***	0.706***
	(0.220)	(0.230)	(0.219)	(0.226)	(0.236)
capital			-0.258		
			(0.733)		
IndiceGini				-3.069**	-2.582*
				(1.485)	(1.522)
GiniPIB					-3.09e-07
					(1.90e-07)
Constant	-5.110*	12.89*	-4.733	-3.979	-2.736
	(3.097)	(6.866)	(3.065)	(3.161)	(3.259)
Observations	1,072	1,072	1,072	1,072	1,072

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 – Odds ratio of the Independent Varibles

VARIABLES	(1) Odds Ratio	(2) Odds Ratio	(3) Odds Ratio	(4) Odds Ratio	(5) Odds Ratio
IDHM	0.0570*	0***	0.0556*	0.0215**	0.0186**
	(0.0915)	(0)	(0.0896)	(0.0362)	(0.0315)
IDHM²		4.832e+17***			
		(6.711e+18)			
lnRecTributaria	0.647***	0.735*	0.648***	0.635***	0.661**
	(0.104)	(0.125)	(0.104)	(0.104)	(0.109)
lnDespCorrentes	2.125***	1.760**	2.087***	2.281***	2.026***
	(0.468)	(0.405)	(0.457)	(0.515)	(0.477)
IndiceGini				0.0465**	0.0756*
				(0.0690)	(0.115)

seEform in parentheses/*** p<0.01, ** p<0.05, * p<0.1

The results show that the IDHM (H2) has significance in the likelihood of the municipalities to affiliate to consortia, with opposite direction. In other words, cities with low IDHM are more likely to affiliate. However, the IDHM² indicates that, from a certain point of high IDHM, the tendency is to increase the likelihood of affiliating to consortia. In these types of consortia, IDHM had a low probability of influencing the models, however in the case of IDHM² the odds ratio is high.

In the hypothesis H3, population size and the fact to be or not to the capital city of the state does not have significance. This also occurs with the hypotheses H5, H6, H7, H8 and H10 in which it is evident that for this type of consortium, the municipal GDP (nor its interaction with the Gini Index), the political party change, the number of municipalities of RM and the number of direct administration employees, do not significantly affect the formation of consortia.

Just as it occurred with the health consortia, in solid waste management the taxation capability(H9) has a high significance in the likelihood of affiliating to consortia. The tax revenues affect in the opposite direction, that is, the smaller the own revenues, the greater the chances to affiliate to consortia, and with an odds ratio of relatively high, around 60% to 70%.

In the case of the Gini Index (H4), the results also followed what happened in the case of health, were significant and negatively affect the probability of consortium adhesion. That is, the higher the rate of Gini index, the higher the concentration of income and the lower the chances of the municipality to participate in solid waste consortium.

An element of distinction and that differentiates itself from health consortia, are the current expenditures H11). In the municipalities affiliated to solid wastes, this variable is significant and positively affects the probability of affiliating to consortia, i.e., municipalities with high current expenditures tend to affiliated to consortia, in an odds ratio above 200%.

9. CONCLUSIONS

The nature of the intermunicipal consortia in metropolitan regions diffusion is a complex subject and requires attention due to the relevance that the consortia affiliation phenomenon represents nowadays in Brazilian public management. Evidently that they represent an innovation that has spread intensely in the country and especially in metropolitan regions. In this sense, it can be seen that the signal given about the possibility of inter- municipal metropolitan cooperation has been important with the intermunicipal consortia.

Regarding the examination of the two dimensions associated with the nature of intermunicipal dissemination , considered from two categories of Rogers herein explored regarding the category complexity, the article showed that although the Law of consortia has been promulgated, the moment of greatest dissemination of Intermunicipal consortia, both in the health area and in the area of solid waste management, occurred just after the creation of the respective laws that regulated their public policies. In the case of health, the period of greater dissemination of the intermunicipal consortia occurred between 1992 and 1998, very close to the creation of the SUS Law - Law 8080/90 and in the case of solid waste management the greatest period of dissemination of consortia occurred after 2010, soon after the Law of the National Solid Waste Policy - Law 12.305/2010.

Concerning the examination of the variables that sought to explain the category compatibility, the first important conclusion concerning the dissemination of the intermunicipal in metropolitan regions that has different behavior in both cases is that municipalities with the HDI below in the case of solid waste tend to affiliate to consortia more often, unlike the health area, where the low IDHs do not have a high probability of affiliating to consortia. Regarding the tax revenues, both the intermunicipal consortia of metropolitan areas of health and of solid wastes show that the smaller the own revenues, the greater the chances to affiliate to consortia. Another important common finding to both areas of Intermunicipal consortia is that the size of the municipalities and the fact of being a capital city has no importance in the consortia affiliation decision making. And finally, another common finding in two areas of intermunicipal consortia herein analyzed is that municipalities with high current expenditures tend to affiliate to consortia more often. This last aspect differs from the Garson' hypothesis (2009) that points to the argument that municipalities with low revenue and low expenditures tend to affiliate to consortia more often due to this aspect. The issue here is that in order to affiliate to a consortium the municipalities require some type of minimum municipal budgetary size, not being simply automatic due to a municipality belonging to small budgetary size it will automatically affiliate to the consortium. To examine and explain more adamantly about this aspect - the relationship between revenues and expenditures and consortia affiliation, it is required a specific study that the work limitations herein is not capable of giving account to.

Some findings tend to disagree with a part of the literature in Brazil that speculated that the decision to affiliate to a consortium and, therefore, the dissemination of the intermunicipal consortia in metropolitan regions, as being an element associated with the influence of the Law of consortia of 2005, to small municipalities with very poor social conditions - with low own revenue and low public expenditures ABRÚCIO; SOARES, 2001; CRUZ, 2002; NASCIMENTO E FERNANDES, 2015, CASTELLANO, 2007; CUNHA, 2004; CRUZ, 2002, STRELEC AND FONSECA, 2011). Evidently that there are all these conditions in municipalities components of consortia in RMs, however in the areas of health and solid waste management in metropolitan areas some findings show that these factors are not preponderant. It becomes necessary, therefore, that we go deeper in the matter in order to be able to reconcile an accurate vision and at the same time precise on the issue of dissemination of the intermunicipal consortia in metropolitan regions.

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