

Measuring institutional capacity and change: the case of Catalan local government in education public policies*

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This paper proposes a measure of institutional capacity for the empirical assessment of institutional change. The aim of the paper is twofold: first, we present an index of local educational capacity that provides an opportunity for measuring institutional change when applied to longitudinal data; second, using the index as an outcome variable, we explore the determinants of the evolution of institutional capacity in order to better understand institutional change of local governments in the education sector. To both build the index and carry out the analyses we use census data from official Catalan sources on all the 947 Catalan local governments for a 10 year period and specifically focused on education policy. The Catalan government holds almost all competences on compulsory and lifelong learning education in the region. In this institutionally narrow scenario local governments demand their space. In order to carry out their educational policies (e.g., building new schools or creating nursery schools), local governments must sign individual agreements with the Catalan government. Most of them include economic transfers from central governments to local institutions. On the one hand, this scenario sets up an adverse and complex institutional setting for local governments, but on the other hand it uncovers the determinants of institutional change. Preliminary findings suggest that local economical and intergovernmental factors (such as the average revenue tax, the average property tax, unemployment rate, and the number of agreements signed) have a relevant impact on institutional change.

Keywords: institutional change, local governments, education, index creation.

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1. Introduction

Institutions evolve and change. Institutions usually are human creations to solve political problems and by its functioning they regulate political processes. Those are quite undoubted assertions. However, the question of how, why and under which conditions they change and are able to give answer to political problems remains partly unsolved, and this is one of the main concerns for political science. This central question has created an impressive and diverse (and usually unapproachable) theoretical corps based on a diversity of approaches (political economy, sociology, history...). This is the reason why this paper will mainly focus on methodological issues, leaving aside deep theoretical discussions. Our basic concern is to create a reliable and replicable index to measure institutional change and institutional capacity applied to local governments. The final aim of the paper is twofold: first, we present an index of local educational capacity measuring institutional change; second, using the index as an outcome variable, we explore the determinants of the evolution of institutional capacity in order to better understand institutional change of local governments in the education sector.

Within this framework, we must give a basic understanding of what we consider an "institution", and what we consider "change" and "capacity" in this work. This will make clear our foundations and will allow us to detail the logic of our index in the next sections. The widely accepted definitions of "institutions" usually include all forms and social structures which affect the behavior of individuals and institutions themselves (Immergut, 2011). In a similar way, North considers institutions as *"the rules of the game in a society, or more formally, are the humanly devised constraints that shape human interaction"* (North, 1990): 3), which implicitly includes both formal rules, such as laws and constitutions, and informal constraints such as conventions and social norms. This subtle difference has been the core question for the renewal of institutional studies.

Starting from the seminal work of March and Olsen (March & Olsen, 1984; March & Olsen, 1990), founding fathers of the so called "New Institutionalism", Peters distinguishes up to five different schools of thought inside these "new institutionalism". For our purposes we follow the version that Peters (2005) calls "empirical institutionalism", that simply wonders about whether institutions cause a difference in the delivery of public policies or the political stability of a system (B. G. Peters & Wright, 2001; B. G. Peters, 2005). For the empirical new institutionalism the key question is to measure and quantify outcomes or characteristics of institutions, rather than finding operational definitions. This empirical institutionalism has attempted to demonstrate that its empirical character is based on the fundamental concern on measurement and collection of quantitative data to trace institutional analysis.

In any case, for this work “institution” is both a formal structure -the different levels of government involved in the intergovernmental game- and an informal one -the political relationships between those levels of government and the individuals who rule them-. This double characteristic is because we use interchangeably institutions and organizations as synonyms⁴.

The main criticism to “New institutionalism” approaches have always been that *“it is almost inherently static while the world of politics, which seeks to explain, is almost inherently dynamic”* (B. G. Peters, 2000); *“The origins of institutions, as well as the sources of institutional change, remain quite opaque”* (Pierson, 2000); *“change has been a vexing problem for rationalists because they tend to assume relatively static preferences, as well as for historicists because they tend to see institutions as consistent and stable constraints on behavior”*(Steinmo, 2008) . Indeed, stability is the most well explained feature of institutions in “New Institutionalism” since it is considered a constant and a foundation of institutions: stability is an intrinsic and natural feature. In any case, the main concern about institutional change is whether it is endogenous or exogenous. The existing theories are quite divided by those considering intentional processes directed by a single person or organization (endogenous) or “evolutionary” by competing with the environment (exogenous). In fact, *“Institutions (...) operate in an environment populated by other institutions organized according to different principles and logics. (...) they routinely face institutional imbalances and collisions.”*(March & Olsen, 2006): 14). The fundamental explanations in political science of change are mainly four: incrementalism, path dependency, punctuated equilibrium and randomness -or “garbage can”- (March & Olsen, 2006; Rothstein, 2011; Thoenig, 2011). Each one of those explanations points out the mechanisms of evolution and change and explains its shape and dynamics. Our approach to change and capacity is rather simple: we understand change as the increase or decrease of educational policies and educational facilities in each of the 947 Catalan local governments from 2001 to 2010. To test our hypothesis we combine several datasets (most of them public and open), to create a final database with 947 municipalities. Given the fact that we want to explain those variations through an index of institutional capacity and change, and there is no clear answer to the exogenous/endogenous dilemma, we decided to combine both possibilities when choosing our hypothesis and the control variables to test them, in order to determine which factor prevail (if so) in institutional change. Our main

⁴ Despite the potential conflict of this decision, we assume that for the study of local government, and its political relations with upper levels of government, both concepts reflect the duality of dealing with structures and behaviors within these structures. In this sense, our approach follows the basic distinction of North which states that organizations are *“groups of individuals bound by some common purpose to achieve objectives”*, while institutions are *“the rules of the game”* (North, 1990). So in this work local governments cannot be understood without considering the people who rule them; at the same time that the attitudes of those people cannot be understood without the structure that covers them.

purpose is to make a modest contribution to the question of measuring institutional change and capacity.

In section 2 we briefly point out and contextualize the complex nature of the educational sector in Catalonia. We introduce the intergovernmental game embedded in a very complex and nested scenario. The Catalan government holds almost all competences and funding regarding education, but local governments claim their space in order to carry out educational policies. Section 3 outlines the main research questions and the consequent hypotheses; data and methodological issues are described in section 4. Section 5 defines the construction of our index of capacity and change, and in section 6 we test the hypotheses. Finally, the main conclusions and further work are discussed on section 7.

2. Local governments and education, an uncertain decentralization.

The main institutional feature of the Catalan and Spanish local government systems is legal uniformity, unclear competencies and underfunded capacity (Calero Martínez & Bonal, 1999; Ferrer, 2009; Planas i Coll, Subirats, & Bonal, 2004; Plandiura & Perdigó, 2002; Subirats, 2002). However, local governments deliver a wide range of public services with tough fiscal constraints. It is true that municipal responsibilities increase with population size, a fact that is properly recognized by the financing system, but only for those competencies recognized by law or by agreements signed between the different scales of government. The resulting institutional design conceptualizes municipalities as multipurpose governments, with major expenditure competencies corresponding to the usual responsibilities assigned to the local public sector (solid waste, environment, urban planning and transportation), with the notable exception of education, which is a main responsibility of regional government. However, regarding education, political scientists had observed, since late 90', an increase on the delivery of this public service by local governments (Albaigés, 2012; Bonal, Essomba, & Ferrer, 2004; Bonal & Albaigés, 2010; Subirats & Albaigés, 2006).

2.1 Local government's claim for educational space, even with sever institutional limitations.

With the Law in hand the main educational competences held by local governments are mainly those related to the construction of schools (including its physical maintenance), and the control of the compulsory schooling (from 6 to 16 years). It is true that the role of local governments in Catalonia has been slightly modified since the approval of the National Education Law (LOE), the Statute of Catalonia (2006) and the Catalan Education Law (LEC), since those norms had made small steps to decentralize some minor aspects. Both educational laws (the Catalan and the Spanish) consider local authorities as an "educational administration", creating with this denomination a

special status which encourages cooperation within levels of government, following the principles of proximity and subsidiarity.

This cooperation and joint action is especially strong in several policy areas, where local governments are able to: organize programs of educational support (outside schools and out of curricula, mainly the *Plans Educatius d'Entorn*), be heard on programming the educational offer within their bounds, and to participate in the process of admission and distribution of pupils (creating *Oficines Municipals d'Escolarització*, OMEs). Regarding more formal education, local governments can participate in the curricular diversification of the *Ensenya Secundaria Obligatoria* (ESO), can promote the creation of *Programes de Qualificació Professional Inicial* (PQPI) and apprenticeships (*Formació Professional*, FP). Also, local governments can be charged with lifelong learning (*Formació d'Adults*)⁵. Finally, the "crown jewel" of local governments is the early childhood learning (*llars d'infants*) which is the noncompulsory public education given to young children from 0 to 3 years. This policy has increased vigorously in importance and it is the most "local" of all educational policies in Spain and Catalonia. In any case, before giving more details it is crucial to notice from now that most of the policies previously referred are implemented through the prior signature of an agreement between local government and the Catalan government (*Generalitat*).

The cooperative scenario described above needs to be somehow detailed because the logic of the Spanish and Catalan education system is a centralized polity. The Catalan system is usually framed within the group of highly centralized education systems (Pedró i Garcia, 2007; Pedró i Garcia, 2009). Obviously in this case it is not question of a centralized polity with State bases, but a "regional centralization". In fact, the Spanish political decentralization has been directed essentially to the regional level. Plandiura and Perdigó (2002) found that local governments are residual and complementary regarding education and their role was marginal by the means of regional political interests⁶.

Another proof of this centralization is the distribution of educational spending by levels of government. The following table clearly shows the extreme financial power of the Catalan Government and the residual place of both local and central governments. The regional level holds almost a 90% of the fiscal capacity over years, and even after

⁵ Take a look at the LEC articles 39, 44.3, 46, 59.4, 60 and 71 for specific policies, and 159 for a general description of local capacities and duties regarding education.

⁶ Plandiura and Perdigó claim for: the need to respect local autonomy and against the regional bureaucratic interests that undermine local decentralization, also for the lack of use of political instruments to enable a real decentralization towards local governments. This is also congruent with Agranoff's perspective that states that regional governments in Spain are very concerned with keeping all the recent decentralized political power in their hands and are not interested in empowering other governmental units like local governments.

transferences. This is a powerful indicator of the economic disproportion when analyzing the relations among the *Generalitat* and local governments in Catalonia because it points out that the dependent nature of those interactions. One actor holds almost all the fiscal capacity to design, create and decide policies, while the other could be almost a mere implementer.

Table 1: Public spending in education by levels of government before/after transferences.

Level of government	Academic years				
	Before transferences (initial expense source)				
	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Regional	93,4%	94,5%	95,6%	96,3%	93,5%
Local	5,2%	4,1%	3,2%	2,5%	5,3%
Central	1,4%	1,4%	1,2%	1,2%	1,2%
Level of government	After transferences (final expense source)				
	89,7%	90,4%	90,5%	91,7%	88,9%
	8,9%	8,2%	8,3%	7,2%	9,9%
Central	1,4%	1,4%	1,2%	1,1%	1,2%

Source: *Sistema d'indicadors d'Ensenyament de Catalunya*, núm. 14, pàgines 41 y 42, 2011

In fact, the main consequences of both a centralized system and the imperative of gratuity and universality in providing the service causes that the main principle for deciding the public spending is population. In other words, the assignation of resources and economic transfers is decided in most of the cases as a function of population, specifically educational population (from 0 to 18 years). This apparently simple criterion implies that most of the classical indicators for measuring education improvement are tricky, and somehow misleading, because in a centralized system they do not express significant differences among units of government. To put it simple, any local government and any public school receives the same basic amount of money regardless of their socioeconomic status, the fiscal capacity of the municipality or the real educational needs of the students. So, the conjugation of population and universality in making economic decisions causes that most of educational indicators perfectly correlate and are in fact collinear⁷.

Besides this fiscal power, the *Generalitat* has the absolute capacity to dictate laws -by the means of the Parliament- and a wide range of administrative compulsory rules. This immense normative power holds, following the logic of universality, the uniformity of the educational public service. Students in the public sector (and most of

⁷ This happens in most of the policy areas when analyzing local governments. Differences are significant in all policies that have not a regional basis, and therefore is difficult to find any differences in policies like education, health or elderly care because they are all depending on the basis dictated from a political center.

the private schools that receive grants) all over Catalonia receive the same curricula and enjoy almost the same physical and educational conditions, regardless any personal or societal circumstance.

2.2 An increasing intergovernmental game.

Even with the highly centralized education system described above, interaction becomes an operative imperative, a sort of a bargaining process that ensures that implementation fits the most with local realities. Without policy coordination and collaboration between different scales, making decisions becomes a hard task. However, as is clear from reading the above paragraphs, the majority of competencies and skills that the institutional framework gives to local governments are a political option. Most of the policies enumerated above (following the LEC) are only potentially municipal if the mayor -and the parties that support him- decides to reach an agreement with the *Generalitat*. So, these policies to be local must be prior by establishing a necessary cooperation.

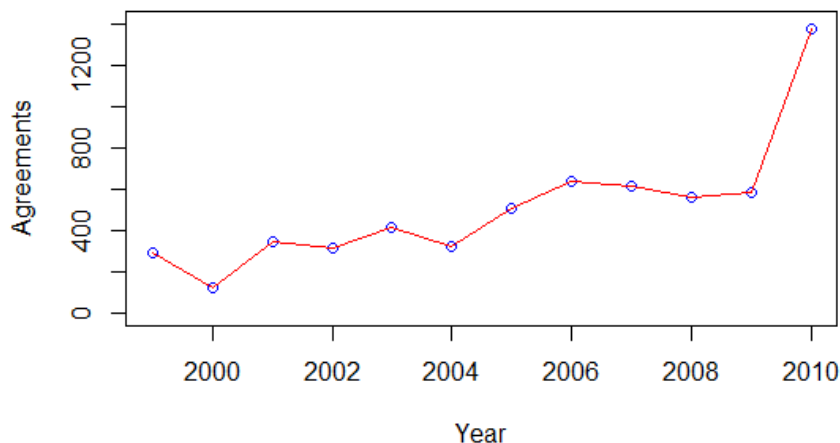
Simplifying the ways that the *Generalitat* and local governments interact, we can consider two main paths: hierarchy and cooperation. For our purpose we leave aside the compulsory relations (laws, decrees, regulation and other kinds of delegated legislation) and we focus on those instruments that need a political pact and are signed in equal terms by both levels of government (mainly, consortia, public foundations, public enterprises and agreements)⁸. Once this distinction made, the optionality of most of the local educational policies implies that, to be provided, must be prior to sign an agreement. This is the reason why those instruments became crucial to understand local government's policies. The complete picture of the importance of this instrument is clearly showed by two means: firstly, the *Departament d'Ensenyament* has not any collaborative instrument other than agreements⁹; secondly, the figure that follows shows the evolution of agreements signed per year between the *Generalitat* and Catalan local governments from 1999 to 2010¹⁰.

⁸ To have more details regarding the hierarchical and collaborative relations among those levels of government take a look at: (Martínez-Alonso Camps & Ysa Figueras, 2003; Martínez-Alonso Camps, Pano, & Medir, 2009)

⁹ The only exception is the *Consorci d'Educació de Barcelona*, but in fact it works as a delegation of the *Departament d'Ensenyament*.

¹⁰ Details of data gathering in section 4.

Figure 1. Total agreements signed per year.



Source: own data

As figure 1 clearly shows, we are facing an impressive increase of intergovernmental relations from 1999 to 2010. However, it is also necessary to point out that the acquisition of educational capacities by signing an agreement does not imply in most of the cases the gain of legal competences, but only the possibility of delivering a concrete service. Usually, signing an agreement implies an economic transfer, a future economic expense and the delivery of a concrete educational service. Besides, by signing such a contract, both parties keep obligated by this signature and usually a new agreement is needed to break the created link.

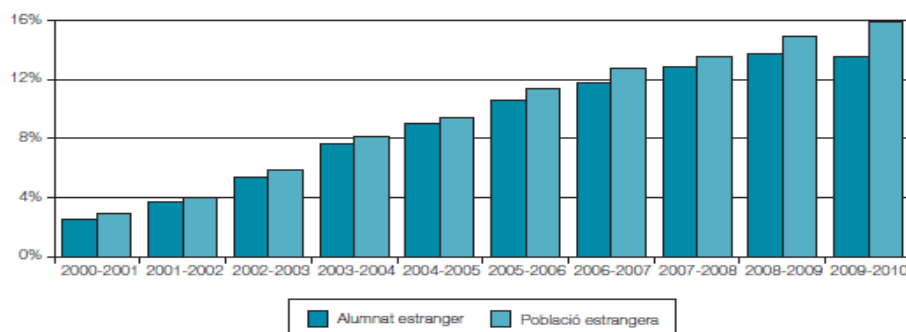
Moreover, if we take a quick look to the dramatic increase of students happened in Catalonia from 2000 to 2010, and especially the increase of the foreign students, this clearly sets up a complex scenario for local governments, with a high systemic pressure for formative demands and massive schooling.

Figure 2. Percentage of foreigners in general population and in student population.

Taula 3.23. Evolució del percentatge de l'alumnat estranger i de la població estrangera respecte del total d'alumnat i del total de la població, a Catalunya

Estrangers	Curs									
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Alumnat	2,5%	3,7%	5,4%	7,6%	9%	10,6%	11,8%	12,9%	13,7%	13,5%
Població	2,9%	4%	5,9%	8,1%	9,4%	11,4%	12,8%	13,5%	14,9%	15,9%

FONTS: Departament d'Ensenyament. Estadística de l'ensenyament i Institut d'Estadística de Catalunya.



Summing up, from the institutional position of local governments, we can conclude that they have a very difficult position. They lack of financial capacities, of own educational competencies, of own capacities to determine academic curriculums and its limited capacity to change the normative basis dictated by the political center, make them a kind of minor governments. Moreover, the most common way to deliver an educational public service is by signing an agreement with the *Generalitat*. The resulting institutional design leaves local governments stuck between local demands and regional authority, with little room to make their own public policies.

3. Research questions and hypotheses.

How local governments have institutionally changed in education to face all those problems? Is it possible to measure institutional capacity and, therefore, institutional change with open data? If so, which are the appropriate variables and indicators to take into account? So the basic research questions indicated above lead us to the construction of an Institutional Capacity Index (ICI) allowing us to measure the evolution of local institutions in education. Mainly, our composite index should be able to capture information revealing relative positions in a given area and, measured through time and evaluated at regular intervals, to be able to point out de direction of change across units and time ((Nardo et al., 2005).

The three main hypotheses to be tested by using our ICI are the following:

H1: institutional changes are due to internal factors of each local government (political, economical, basic characteristics of local society)

H2: institutional changes are due to the nature of the intergovernmental game in which each LG is embedded (political coincidences, agreements signed, political mood)

H3: institutional changes are due to improvement of educational skills and the ability to diversify concrete educational policies.

It is important to notice that those three hypotheses are conceived to test whether institutional change is internally driven (basically *H1*, and *H3*) or whether institutional change is mainly exogenous (mainly *H2*). And all three hypotheses are trying to answer different relevant aspects that may cause institutional change. *H1* searches to explain changes caused by factors that are unique and different in any local government and related to its political, economical and social life. *H2* seeks to explain change by the intergovernmental game and the political bargaining process that implies. *H3* takes into account the importance of educational results and the existence of certain educational institutions to test institutional change.

4. Data and methodology.

Our ICI should take into account some basics regarding the construction of composite indicators, and specially should make transparent the criteria used to build it. As institutional capacity and change are not easily measured by a single indicator we need to find a composite indicator. A composite indicator is formed when individual indicators are compiled into a single index on the basis of an underlying model and it should ideally measure multidimensional concepts (Nardo et al., 2005).

4.1 Data gathering and treatment.

The fact of working with local institutions allows working both with a high number of units (947 local governments for the Catalan case) and to use a complete and huge variety of data. However data sources are often dispersed through different locations and internet repositories, and often are presented in heterogeneous ways. So, most of the work consists on matching registers in each local government and “cleaning” the different databases by purging the duplicate records and searching for erroneous merges.

We have matched data for each local government unit coming from *Idescat* (official statistical site of Catalonia), *Municat* (public official data on Catalan local governments), *Departament d’Ensenyament* (the educational ministry), *Dades obertes* (public database from Catalan government), *Ministerio de Hacienda y Administraciones Públicas* (Spanish Ministry) and the *Banc de dades de càrrecs electes: dones i homes protagonistes a les institucions democràtiques* from ICPS (Catalan public research institute). All this on-line sources provide data such as: number and type of schools, number of students, population and population by age group, mayors and parties, average revenue tax, average property tax, unemployment rate...

Moreover, despite this wide range of available data, an intense fieldwork was necessary regarding the collection of agreements between the *Generalitat* and Local governments. Agreements are the fundamental way in which regional and local governments interact and cooperate in education policies. Those agreements provide outstanding and unprecedented knowledge on the political nature of administrative cooperation. We analyzed one by one all the agreements signed by the *Generalitat* and, at least, a local government from 1999 to 2010, and we obtained information about the topic, the date it was signed, the politicians involved in the signature, the political mood and the financial resources included, among others¹¹. Besides all those data, we

¹¹ For a complete account of this process, please refer to the PhD dissertation of Lluís Medir *Interdependencias institucionales y gobierno multinivel: el caso de los municipios y la política educativa*, 2013 (unpublished).

also obtained much more sensitive data directly from the *Departament*, such as: ESO results, disaggregated at the school level, and student's nationality also at school level.

With all those indicators we build a main database with the 947 local governments as observations, and with the Institutional Capacity Index described in the next section for each year from 2001 to 2009 (ICibase). We also added to ICibase the control variables explained in section 5.3 in order to explain institutional change with a multivariate perspective.

4.2 Methodology

To test our hypotheses we fit OLS regression models with the index ICI as the outcome variable, which shall be described in the next section. As a main analysis we proceed to test the three main hypotheses detailed in section 3, and finally we generate a complete model based only on the most relevant indicators explaining institutional change from each one of H1, H2 and H3. The final purpose is to give some partial explanations answering the main hypotheses and, after that, try to capture the importance of the main indicators affecting institutional change in a general way, leaving aside the hypothesis-driven groups of variables.

Regarding independent variables, we use different indicators of political, economical and social issues that are not theoretically correlated with any of the composite indicators composing the ICI. Additionally, the creation of the ICI includes controls with categorical variables such as the legal competence level (following LBRL) or the number of elected (following also LBRL) in section 6.

5. Institutional Capacity Index.

Our goal is to build an index that is reproducible and transparent, following the fundamental basis of scientific rules. By reproducible we mean the fact that anyone with the same information and data should reach the same conclusions, and transparency includes the public availability of data and, above all, the clarity of the process of creating and calculating the index. Whichever framework is used, transparency must be the guiding principle of the entire procedure.

5.1 Theoretical basis

There are some basic steps to follow when constructing a composite indicator. First, develop a theoretical framework and select the appropriate data. In this sense, the quality of a composite indicator as well as the soundness of the messages it conveys depend not only on the methodology used in its construction but primarily on the

quality of the framework and the data used (Nardo et al., 2005)¹². Secondly, it is useful to make explicit the multidimensional concepts underlying the indicators chosen and the sub-groups of concepts that represent, and it is also important to state that these sub-groups need not to be statistically independent of each other, but in this case the existing linkages should be described theoretically or empirically to the greatest extent possible. Thirdly, it is crucial to deal with missing data, but in our case, this is not a point¹³. Finally it is necessary to explain the aggregation procedure and the normalization before begin the analysis. Some parts of this path have already been done, others follow in this section.

5.2 Construction and indicators of ICI.

The ICI selects and converts the main open indicators covering three basic sub-groups of variables of educational capacity at the local level in a single composite indicator for each year from 2001 to 2009. It takes indicators from: local population, local education facilities and the public-private ownership of local educational institutions. First of all it includes population trends (educational and general population) calculated in relation with the decisional units of the regional government (the *Serveis Territorials-ST*) to avoid territorial disparities, and it also covers the different types of educational facilities located in each local government and its effects¹⁴, and finally it takes into account the equilibrium among private and public ownership. Those three main groups of variables cover the basic trends of educational capacity from three different perspectives (population, institutions and the public/private cleavage). Each indicator is standardized to have a range [0,1] and, in order to capture the information for each local government, we have taken into account three different universes as a reference for our data: the ST which belongs the local government, the local government itself, and the global information at the regional level.

In our ICI we have not only independent indicators which can “randomly” vary from one local government to another (2,5,6,7,8), but also some indicators that are internally collinear or dependent (1,3,4). We decide to include evident collinear indicators to create an index with a consistent and common sense reflecting the uniformity of the institutional design previously mentioned. This decision implies two main consequences: 1) the inability to use certain indicators as control variables later on; and

¹² In the same work it is also stated that “*the peer community is ultimately the legitimate forum to judge the soundness of the framework and fitness for purpose of the derived composite*” (page 17).

¹³ We are dealing with public databases and basic institutional features, so usually there is no problem of scarcity of responses or misinterpretation of questions and answers like it is the case on surveys to individuals.

¹⁴ We calculate all population and educational facilities indicators as a ratio between local data and upper local administrative data (the so called *Serveis territorials*) in order to capture the relevance of the municipalities within its own territorial decision making units, avoiding by this mean misleading comparisons.

2) gives a coherent sense in a centralized educational system making an index especially sensitive to independent indicators. So we combine the common indicators shared by all in the same proportion, but we add a portion of indicators potentially independent to better assess the differences between units. For this reason we cannot use other indicators that are also strongly collinear to it ICI as control variables (number of teachers, economic transfers from regional government...). Table 3 summarizes the nine indicators chosen for each variable group.

Table 2. Components of the Institutional Capacity Index for each local government.

Name	Type*	Description
ICI001	C	Total educative institutions, as a ratio local/ST**
ICI002	C/I	Total local nurseries, as a ratio local/ST
ICI003	C	General census of population, as a ratio local/ST
ICI004	C	Educative population as a ratio local/ST
ICI005	I	Local educative attraction, as a ratio local students (0-16)/ local census (0-16)***
ICI006	C/I	Compulsory diversity, as a ratio of existing educative institutions/total possible different institutions****
ICI007	C/I	Optional diversity, as a ratio of existing educative institutions/total possible different institutions****
ICI008	I	Public sector dimension as a ratio public institutions/total institutions
ICI009	I	Private sector dimension as a ratio private institutions/total private institutions in ST

* Refers to the collinear or independent nature of the indicator

** Includes all kind of educative institutions.

*** This indicator has a threshold at 1 to avoid the territorial interferences caused by local governments surrounded by very small towns without educational facilities

**** The Catalan system has up to 3 different types of educational institutions: *Educació infantil i primària (CEIP); Educació secundària; Educació primària i secundària;*

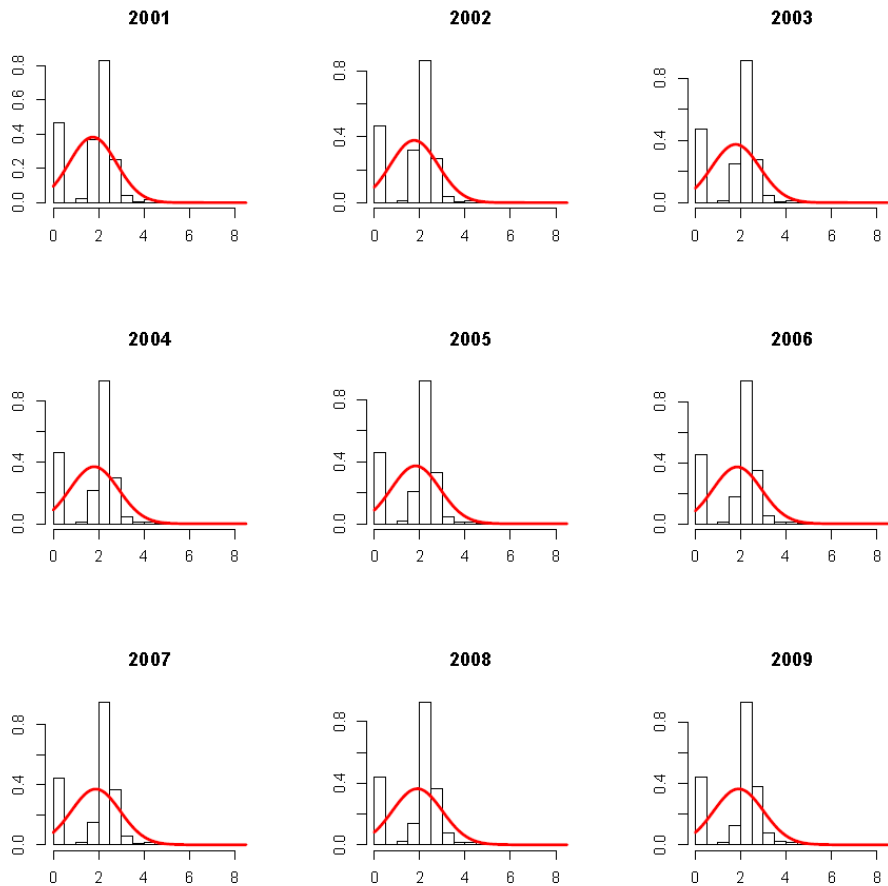
***** The Catalan system has up to 11 different types of non compulsory educative institutions: *Exclusius d'infantil; Específics d'educació especial; Arts Plàstiques i Disseny; Estudis superiors de disseny; Conservació i restauració de bens culturals; Música: escoles, conservatoris, ensenyaments superiors; Dansa: escoles, ensenyaments professionals, ensenyaments superiors; Art Dramàtic; Idiomes; Esports; i Formació Permanent d'Adults)*

The ICI presents the following formula:

$$ICI = \sum_{i=1}^9 X_i$$

which is the sum, for each local government, of the values of the 9 selected indicators (X in the formula), so that it is standardized to have a range [0,9]. So, each of the indicators is weighed as 1/9 having the same importance. The final value of ICI for each local government should be somewhere in-between 0 and 9. It is important to notice that, even if the has not any educational institution, it always has population, so the ICI would be never 0, but it will take reduced values. This reality affects on average to 250 local governments in Catalonia. The following figure shows the distribution of the values for ICI from 2001 to 2009.

Figure 3. Distribution of ICI from 2001 to 2009



Source: own creation.

This figure clearly shows the complex scenario that creates the existence of a large number of small local governments without educational institutions, and a high concentration of ICI values around 2 values¹⁵.

One methodological possibility to continue with OLS regressions could be to avoid analysis on those local governments without educative institutions, the ones that can create a sort of quasi-bimodal distribution. However, we decided to carry out our analysis with the 946 units because we wanted to analyze local government in an ecological manner. It should be noticed here that, given the fact of absence of certain data, most of the models exclude small towns without some of the selected independent variables (listed in the next section). In this sense, the most consistent

¹⁵ A brief description of the basic descriptive statistics of ICI values is provided in the appendix.

answers to our hypothesis, regarding the N of the models, are H1 and H2, and the weakest H3¹⁶.

5.3 Main independent variables and preliminary tests.

To test the hypothesis we are proposing, we select up to 15 theoretically independent indicators having an special linkage to the theory behind each *H*. The different indicators cover fundamental political, economical and social issues related to the theory and nature of education in Catalonia, as it is indicated on sections 1 and 2.

The complete description of each independent variable for each Hypothesis is:

Hypothesis 1: economical and political factors:

Alcaldes: continuous variable measuring the number of different mayors in office in town from 1979 to the reference year. Calculate from data of the Catalan government and the Ministry of Finance and Public Administration.

Partits: numerical continuous variable measuring the number of different political parties holding Mayor's office from 1979 to the reference year. Calculate from data of the Catalan government and the Ministry of Finance and Public Administration.

IRPF: numerical continuous variable measuring the resulting quote of the IRPF per habitant. It has been calculated from dividing the resultant quote of IRPF by the local census of inhabitants. Source: IDESCAT.

IBI: continuous variable measuring the amount of the property tax per habitant. It results from dividing the values of property tax for rustic and urban properties by local census of inhabitants. Source: IDESCAT.

Atur: percentage of unemployment at the local level. It is calculated dividing the total number of unemployed people by local population for each year. Source: IDESCAT.

Extra-UE: percentage of non European citizens living on the city. It has been calculated by dividing the number of non EU citizens by the local census for each year. Source: IDESCAT.

Hypothesis 2: Intergovernmental factors:

Convenis: continuous numerical variable measuring the number of agreements signed by the local government and the Educational Department in every year considered. Source: own work.

¹⁶ We only have ESO results from 2006 to 2009, and indeed these results are only available for the 104 local governments that have secondary education institutions within its borders.

Despesa ambdós: continuous variable that takes into account the number of agreements that include economic spending from both levels of government for each year to implement the public policy. Source: own work.

Despesa Generalitat: continuous variable that takes into account the number of agreements that include economic spending only coming from the Generalitat, and therefore not from local government, for each year to implement the public policy. Source: own work.

Despesa local: continuous variable that takes into account the number of agreements that include economic spending only coming from the local government, and therefore not from the Generalitat, for each year to implement the public policy. Source: own work.

Coincidència: dichotomous variable that identifies those local governments where there is political coincidence between the mayor and the ministry of education of the Generalitat for each year. Source: data of the Catalan government and the Ministry of Finance and Public Administration

Hypothesis 3: Educational factors:

Alumnes extra-UE: numerical variable expressing the percentage of non EU members students in each local government. It is calculated dividing the number of non EU students by the total number of students in each city. Source: Generalitat de Catalunya – Departament d’Ensenyament.

Aprovats: numerical variable expressing the percentage of students passing ESO in each local government. It is calculated dividing the number of passing students by the total number of students finishing ESO in each town and year. Source: Generalitat de Catalunya – Departament d’Ensenyament.

OME: dichotomous variable measuring the existence or not of the *Oficina Municipal d’Escolarització*, which is a municipal institution that participates on the distribution of the inscription and assignation of students among local schools. Source: Generalitat de Catalunya – Departament d’Ensenyament.

PEE: dichotomous variable measuring the existence or not of a *Pla Educatiu d’Entorn*, which is the main educational policy. Source: Generalitat de Catalunya – Departament d’Ensenyament.

And to have a final picture of the independent variables the following table summarizes the distribution of all variables among year and local government:

Table 3. Availability of data for each indicator and year.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Alcalde	946	946	946	946	946	946	946	946	946
Partits	946	946	946	946	946	946	946	946	946
IRPF	464	464	465	465	465	465	465	465	465
IBI	946	946	946	946	946	946	946	946	946
Atur	946	946	946	946	946	946	946	946	946
Extra-UE	946	946	946	946	946	946	946	946	946
Convenis	946	946	946	946	946	946	946	946	946
Despesa ambdós	946	946	946	946	946	946	946	946	946
Despesa Generalitat	946	946	946	946	946	946	946	946	946
Despesa municipi	946	946	946	946	946	946	946	946	946
Coincidència	946	946	946	946	946	946	946	946	946
Alumnes extra-ue	0	0	0	0	726	729	733	733	733
Aprovats	0	0	0	0	104	0	104	104	104
OME	946	946	946	946	946	0	946	946	946
PEE	946	946	946	946	946	946	946	946	946

Source: own creation.

5.4 Controlling the ICI.

To complete the representation of the creation of the ICI we propose a few controls in order to better assess the behavior of our index when it is submitted to certain crucial aspects like population. As explained above, the Catalan Napoleonic model of local government has produced that city size is a strong predictor for every model or research being carried. In other words, population and therefore city size, tends to explain almost every aspect we might observe in the Spanish and Catalan local governments. So, we have carried out two different procedures.

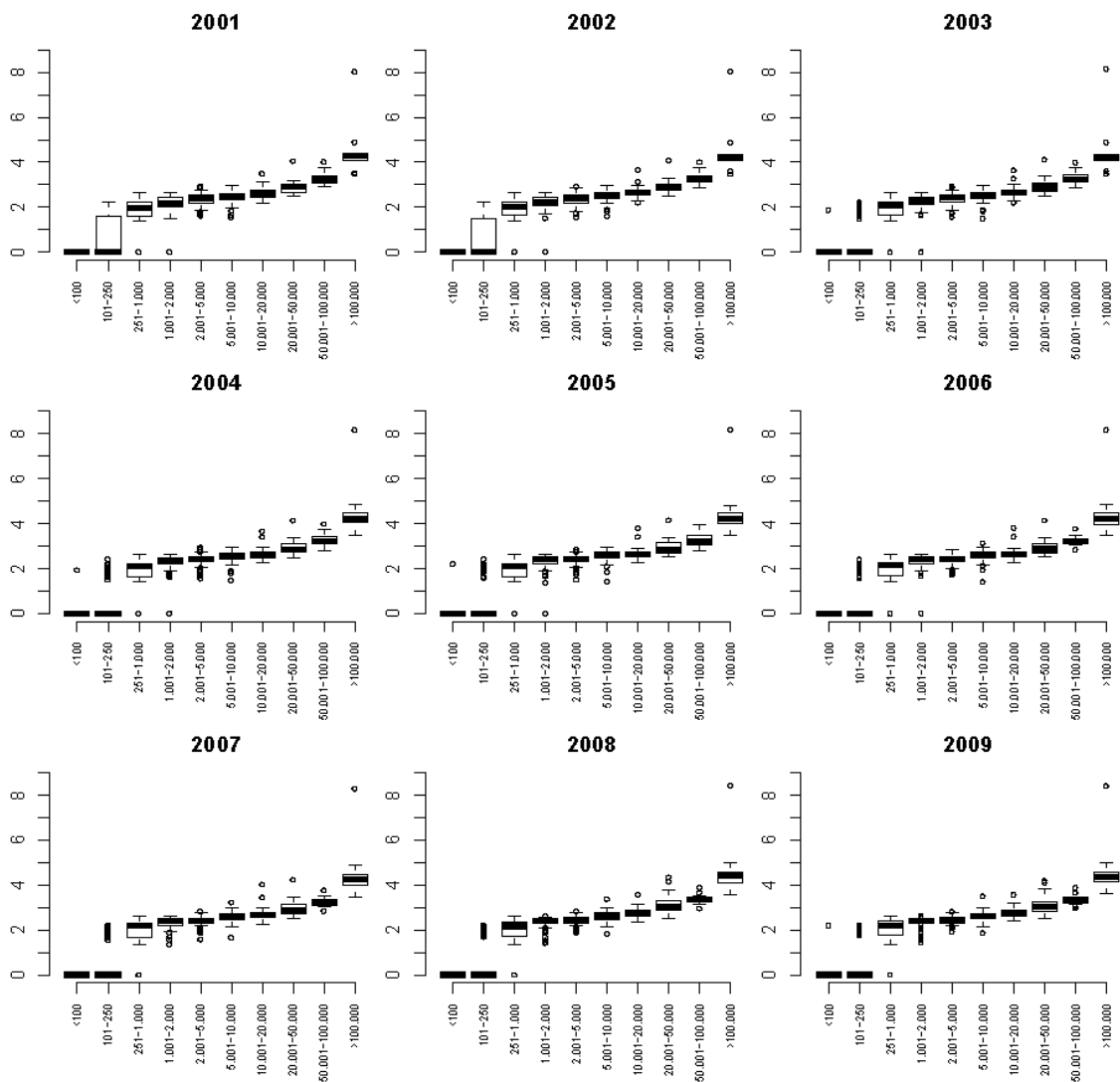
First, we have fitted a multivariate lineal regression model with the new index as the response variable, and the 9 components of the index as predictors. Our aim here is to check for anomalies in the relationship between those variables. Due to its tautological nature, obviously R^2 is equal to 1, since the model is a perfect combination of the 9 predictors. Moreover, all regression coefficients for all predictors have identical value, exactly $1/9$. All that said, all the variables seem to contribute individually to the index.¹⁷

¹⁷ The results may be observed in Table 2 in the Appendix.

Therefore, we may conclude that all the variables considered have a relevant impact to the index.

Secondly we test the distribution of the ICI by a variation of population and its behavior across time. More precisely we take in to account, the political size of the municipality¹⁸ and the compulsory level of competencies¹⁹. Both analysis show congruent results and no relevant interferences appear, as it is shown in the next two figures.

Figure 4: ICI and political size (LOREG)

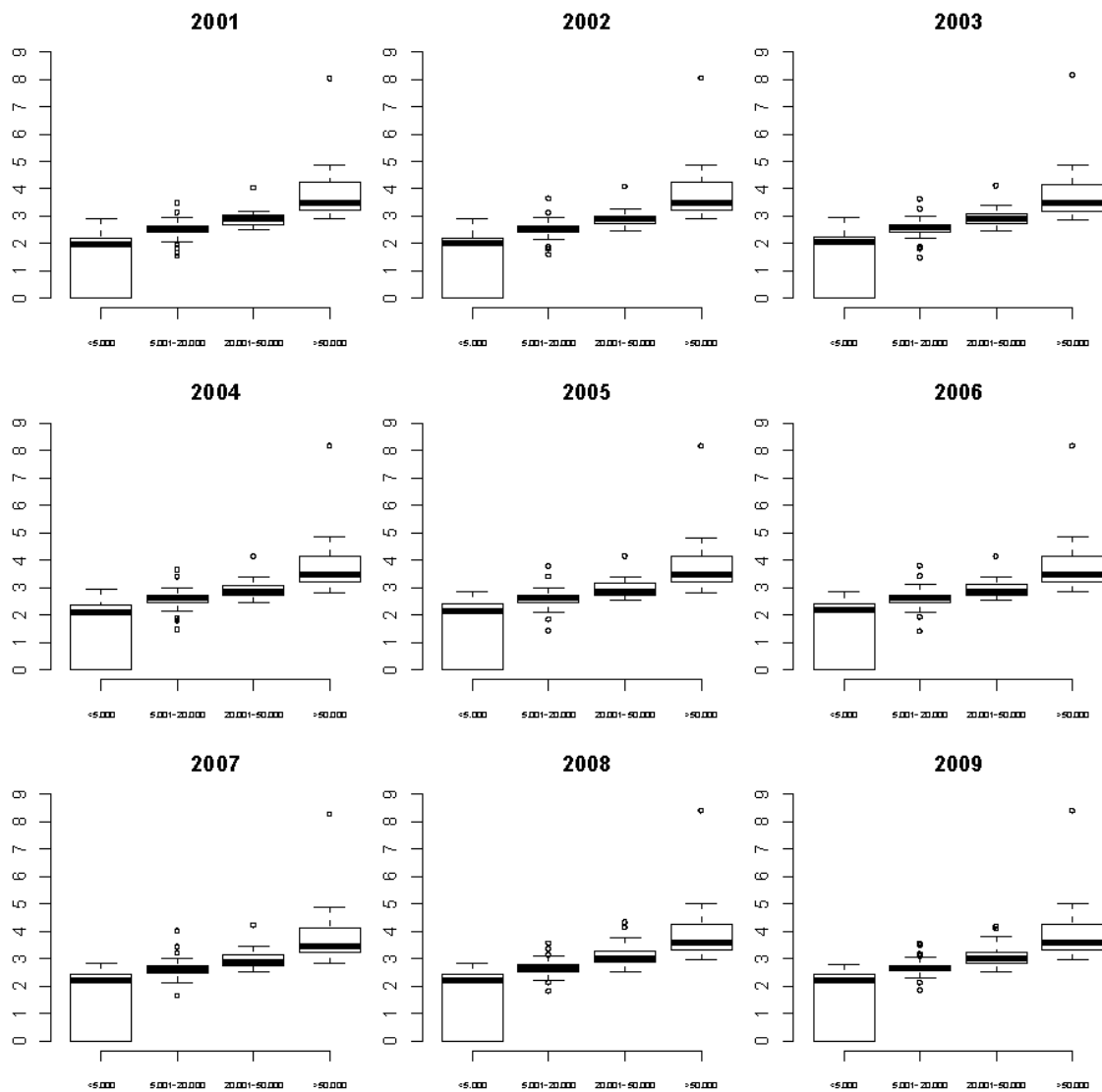


Source: own creation.

¹⁸ Which is to say, it represents the number of elected politicians in each local government, as it is established in the article 179 of the *Ley Orgánica de Régimen Electoral General* (LOREG).

¹⁹ In the same way, this concept is represented by the article 26 of the *Ley reguladora de las Bases del Régimen Local* (LBRL).

Figure 5: ICI and level of competencies (LBRL)



Source: own creation.

Those results show a natural increase of the ICI in parallel to population, but also show the absence of significant outliers (except Barcelona for all the cases) and highlights the centralistic model of local government, and specifically regarding educational policies. This makes even more interesting to know which factors prevail or explain variations within local government bands regarding institutional change.

6. Hypotheses testing.

In order to test the three hypotheses we run an OLS regression for each hypothesis and year from 2000 to 2009 from which we only offer here the resumed tables with the coefficients and its significance²⁰.

²⁰ Compete models and data bases are available upon request.

Regarding *H1*, which accounts for analyzing institutional changes as a function of internal political and economical factors, we find the following table:

Table 4. OLS regression based on local factors

	2001	2002	2003	2004	2005	2006	2007	2008	2009
(Intercept)	2,679 ***	2,518 ***	2,573 ***	2,582 ***	2,614 ***	2,626 ***	2,848 ***	2,95 ***	3,094 ***
Alcalde	0,02	0,02	0,01	0,01	0,01	0,01	0	0	-0,01
Partit	-0,075 **	-0,08 **	-0,074 **	-0,073 ***	-0,069 ***	-0,072 ***	-0,079 ***	-0,082 ***	-0,077 ***
IRPF	-0,286 ***	-0,251 ***	-0,23 ***	-0,195 ***	-0,184 ***	-0,17 ***	-0,179 ***	-0,162 ***	-0,193 ***
IBI	-0,005 .	0	0	0	0	0	0	0	0
Atur	0,08	5,13	3,35	3,36	2,99	3,27	1,24	0,73	-1,22
Extra-UE	0,026*	0,028 **	0,029 ***	0,029 ***	0,023 ***	0,019 ***	0,019 ***	0,02 ***	0,019 ***
R2 adj	0,15	0,17	0,17	0,19	0,2	0,21	0,26	0,29	0,32

Significations: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.'

The different models show, in a consistent and persistent manner, that the number of parties in office, the IRPF and the presence of foreigners (non UE members) have a significant impact on ICI. The persistent negative sense of “Partit” seems to explain that the more different parties had governed in a locality, so the less political stability, affects in a negative way the ICI. Put it on the other way round: political stability (in terms of parties, not persons) seems to have a positive impact on institutional capacity and change. The coefficients for the “IRPF” variable are somehow counterintuitive because an increase of the IRPF has a slightly negative impact on ICI. Finally, the “Extra-UE” indicator has a persistent and positive effect on ICI. This fact can partially agree with the immigration pressure described on section 2, meaning that public administration find in the increase of local institutional capacity on education a way to process the problems that generate such an arrival of newcomers from different countries.

Regarding *H2*, which accounts for analyzing institutional changes as a function of the increasing intergovernmental scenario described in section 2, we find the following:

Table 5. OLS regression based on intergovernmental arranges.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
(Intercept)	1,892 ***	1,937 ***	1,912 ***	1,608 ***	1,554 ***	1,515 ***	1,561 ***	1,601 ***	1,647 ***
Convenis	0,465 ***	0,767 ***	0,299 ***	0,62 ***	0,516 ***	0,19	0,213 **	0,372 ***	0,331 ***
Despesa ambdós	-0,19	-0,343 *	0,206 *	-0,192 .	-0,08	-0,02	0,09	0,01	-0,16
Despesa Generalitat	0,01	0,02	-0,22	-0,08	-0,14	0,25	-0,09	-0,08	0,14
Despesa local	-0,08	-0,378 *	-0,09	-0,313 .	-0,03	0,24	0,227 *	0,07	-0,1
Coincidència	-0,468 ***	-0,525 ***	-0,39 ***	0,287 **	0,25 *	0,374 ***	0,352 ***	0,273 ***	0,329 ***
R2 adj	0,24	0,22	0,23	0,19	0,22	0,25	0,26	0,24	0,2

Significations: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.'

As in the previous case, the different models show certain regularities and relevant indicators having a significant impact on ICI. For *H2*, models assume that “Convenis” and “Coincidència” are the principal indicators affecting institutional change. Both are constantly significant during most of the years. The importance of “Convenis” suggests the important of intergovernmental agreements as a change engine. “Convenis” are political agreements signed in equal terms reflecting consensus and concurrence of political choices, and their impact is –although decreasing with time–, very strong and positive. On the other hand, the “coincidència” indicator is also significant across time but has a different behavior: it acts like a constrictor of change for years 2001 to 2003 (showing strong negative coefficients), while it is a strong driving force of change from 2004 to 2009 (with strong positive coefficients). The explanation is rather simple, in 2004 there was a political change on the *Generalitat*, passing from the conservative party CiU to the left coalition called the “*Tripartit*” (socialists, pro-independence party and green communists). The political change at the regional level is important because it affects in an opposite way institutional change: *CiU* signed more agreements with all kind of local governments (especially the big ones, historically led by left wing governments), while the *Tripartit* signed more agreements with its natural counterparts (the same big local governments governed by leftists’ coalitions). In any case, the importance of the coincidence of political appears as crucial.

H3 accounts for educational factors explaining institutional change. As we mentioned before, the scarcity of data regarding this hypothesis makes it the less complete of three. However, important conclusions can also be drawn. The following summary table stands out that the main factor affecting significantly (and positively) institutional change is the existence of an OME (*Oficina Municipal d’Escolarització*):

Table 6. OLS regression based on educative factors.

	2005	2007	2008	2009
(Intercept)	2,65 ***	2,699 ***	2,695 ***	2,649 ***
Alumnes extra-ue	-0,01	-0,01	0	0
Aprovats	0	0	0	0
OME	0,09	0,543 ***	0,577 ***	0,567 ***
PEE	0,943 ***	0,14	0,18	0,174 .
R2 adj	0,49	0,34	0,4	0,4

Significations: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.'

The OME appears as a kind of powerful engine of change: those municipalities having this educative-political institution have a significant increase in ICI over time. In fact the OME is one of the most important policies that local governments can deliver

regarding education, and the model shows that it has, indeed, a relevant impact on local institutional capacity.

The final ICI model, willing to explain the main factors determining institutional change, created from the aggregation of all data in a single dataset (from 2000 to 2009, generating a model based on more than 7000 observations), and reproduced only with the most relevant indicators taken from the analysis of the three main hypotheses, takes this form:

Table 7. Final model. OLS regression.

```
Call: lm(formula = index2 ~ partit + rirpf.qr + rnue + convenis + coincideix + ome, data = bd.long)

Residuals:
    Min       1Q   Median       3Q      Max
-2.5251 -0.1639  0.0290  0.1832  4.3580

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  2.461719   0.023154 106.318 < 2e-16 ***
partit       -0.028101   0.005958  -4.716 2.49e-06 ***
rirpf.qr     -0.086771   0.008019 -10.821 < 2e-16 ***
Extra-UE     0.011813   0.001672   7.064 1.93e-12 ***
convenis     0.170149   0.004963  34.287 < 2e-16 ***
coincideix  -0.060232   0.013859  -4.346 1.42e-05 ***
OME          0.016640   0.033457   0.497  0.619

---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.4098 on 3711 degrees of freedom
(7634 observations deleted due to missingness)
Multiple R-squared:  0.4185, Adjusted R-squared:  0.4175
F-statistic: 445.1 on 6 and 3711 DF, p-value: < 2.2e-16
```

This final model confirms and stresses the importance of the selected indicators, appearing as a robust result, to understand some determinants of institutional change. Indeed, this final model adjusts better the coefficients of change. For instance, the most relevant impact on ICI relays on “convenis” which offers a strong positive impact of 0.17 (which is a relevant impact, regarding the distribution of ICI values in appendix), while other indicators moderate their impact in a more “realistic manner”, observing lower (either positive or negative) coefficients of change. The second important question is that these indicators preserve the sense of the coefficients (positive or negative) respect to the original models. This is, they affect ICI in the same direction even when analyzed together, reinforcing the robustness of the results.

7. Conclusions and discussion.

We think that the created index is a modest and primary contribution to a better understanding of institutional change for large institutional N settings. In this paper

we wanted to test the creation and a set of preliminary results of this index to continue working on an even more reliable instrument of measure. We have analyzed institutional change and we reach a robust final model that explains 42% of variance which is a relevant result. Moreover, the robustness of these results reinforces the interpretations of the three Hypotheses presented, as well as the wicked nature of institutional change. The final model assumes that the main indicators explaining the three possible sources of institutional changes (local factors, intergovernmental relations and educative policies) are together, at the same time, a powerful source of institutional change.

However, there is still room to improve this work, basically in terms of methodological issues and choices. We identify a relevant set of questions which merited to be considered.

1. When analyzing local governments we decided to study the system in an ecological manner, and this leads to question of the treatment of outliers and deviant cases. We have Barcelona as a persistent and very strong deviant case that may affect results. In a similar way, the about 205 local governments that do not have any educative institution take therefore a very small value on ICI, creating a sort of distortion of the observed values. Would the ICI be more robust identifying indicators of change when excluding deviant cases in the OLS analysis? If yes, is it acceptable to analyze reality partially, having the possibility of analyzing the complete system?
2. The main question of the impact of population. When studying local government, it is well known that population explains any problem to be addressed. In this sense, given the fact that population is somehow reflected on the composites of ICI, should it be worthy to use it as a control variable in OLS models?
3. To reinforce the analysis of H3 mainly with the study of educational segregation at the local level, and obtaining more data on academic results.
4. The crucial aspect of weighting the indicators composing the ICI. We assume that all 9 indicators have the same impact on ICI, but finally this is an arbitrary assumption. How to find a method to weight some indicators more or less than others? The answer should be a theoretical or an empirical question?

Finally, further work should take into account the possibility of creating a similar index, with the same philosophy, but for other policy areas at the local level.

Appendix

Table 1. Summary statistics for ICI

Año	N	Media	Desviación	Mínimo	Máximo	q25	q50	q75
2001	946	1,74	1,04	5,82E-05	8,03	1,56	2,12	2,42
2002	946	1,76	1,05	5,69E-05	8,05	1,58	2,16	2,42
2003	946	1,78	1,07	6,00E-05	8,15	1,62	2,2	2,42
2004	946	1,81	1,07	5,87E-05	8,18	1,62	2,2	2,42
2005	946	1,83	1,07	5,92E-05	8,17	1,64	2,2	2,42
2006	946	1,85	1,07	6,60E-05	8,17	1,69	2,2	2,43
2007	946	1,88	1,08	6,08E-05	8,29	1,71	2,21	2,45
2008	946	1,9	1,1	5,74E-05	8,41	1,8	2,32	2,46
2009	946	1,91	1,1	5,65E-05	8,41	1,84	2,38	2,49

Table 2. OLS regression with ICI as an outcome variable

```

Call: lm(formula = index ~ a + b + c + d + e + f + g + h + j)

Residuals:
    Min       1Q   Median       3Q      Max
-2.204e-14 -2.428e-15  1.180e-16  2.386e-15  2.220e-14

Coefficients:
            Estimate Std. Error  t value Pr(>|t|)
(Intercept) 8.521e-15  1.451e-15  5.871e+00 6.62e-09 ***
a           1.000e+00  2.432e-14  4.111e+13 < 2e-16 ***
b           1.000e+00  1.420e-14  7.040e+13 < 2e-16 ***
c           1.000e+00  9.629e-16  1.039e+15 < 2e-16 ***
d           1.000e+00  3.283e-15  3.046e+14 < 2e-16 ***
e           1.000e+00  3.329e-14  3.004e+13 < 2e-16 ***
f           1.000e+00  3.104e-14  3.222e+13 < 2e-16 ***
g           1.000e+00  8.313e-16  1.203e+15 < 2e-16 ***
h           1.000e+00  1.152e-15  8.684e+14 < 2e-16 ***
j           1.000e+00  1.444e-14  6.926e+13 < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.514e-15 on 716 degrees of freedom
(220 observations deleted due to missingness)
Multiple R-squared: 1, Adjusted R-squared: 1
F-statistic: 1.42e+30 on 9 and 716 DF, p-value: < 2.2e-16

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