

# **Agency proliferation and the globalization of the regulatory state.**

**Introducing a data set on the institutional features of regulatory agencies**

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# **Agency Proliferation and the Globalization of the Regulatory State.**

## **Introducing a data set on the institutional features of regulatory agencies**

### **Abstract**

State structures have experienced significant transformations as globalization spread. This paper is about how to measure one major change: the worldwide proliferation of public agencies with regulatory tasks that has occurred in recent decades. Yet, it remains unclear how their configurations vary across countries and sectors, and what can be learned from these variations. To better identify them worldwide, we introduce a new dataset on the institutional features of 800 agencies in 115 countries and 17 policy sectors. The dataset contains variables from their institutional profiles, covering a broad range of formal characteristics. Our variables are grouped into four blocs: regulatory responsibilities, managerial autonomy, political independence, and public accountability, to provide a tool to examine in depth the diverse faces the regulatory state has adopted along its globalization path. In doing this, we depart from the view that a single dimension does capture the actual diversity of institutional forms regulatory agencies may exhibit. We also use factor and cluster analyses to assess their various forms, and suggest a typology of agency institutional models to facilitate more precise studies on the regulatory state. Results confirm that the regulatory state shows larger variety than usually expected.

Keywords: Public administration, political institutions, regulatory governance, agency accountability, agency independence

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## 1. Introduction

State structures have undergone significant transformations in the age of globalization. These range from the diffusion of new institutional designs to the popularization of innovative policy instruments (Bell and Hindmoor 2009, Drezner 2007, Holton 2011, Levi-Faur 2005). Furthermore, the establishment of agencies endowed with regulatory tasks has become ubiquitous. Stemming from some well-established institutional models in a few Anglo-Saxon countries, and prompted by a diffusion process, from the 1980s onwards, regulatory agencies have proliferated at the national level in multiple sectors worldwide (Braithwaite 2008, Jordana et al. 2011b, Sabatier 1975).

In this research note, we introduce a novel dataset of regulatory agencies in developed and developing countries. Our dataset identifies 43 variables drawn from the agencies in 17 policy sectors in 115 countries and measures different institutional and organizational characteristics. These include how agency members are selected and remain in control, how internal decisions are taken, which resources the agency relies on, how formal relations with other political institutions are designed, and the scope of responsibilities and powers assigned to the agency. In doing this, we expect to broaden the current understanding of their global expansion and adaptation to different sectoral and national contexts.

The rise of regulatory capitalism and the diffusion of the regulatory agency model have triggered a vast and rich literature (see inter alia Gilardi 2008, Jordana et al. 2011a, Levi-Faur 2005, Majone 1994). Comparative studies of regulatory agencies across countries and sectors thus abound. Recent efforts in the field have focused on the development of databases and the introduction of a variety of quantitative techniques to assess the establishment of regulatory agencies, their institutional characteristics and impact on democratic governance. However, until now, these studies have focused strongly on developed countries. In most cases, analyses remained circumscribed to countries in the Organization for Economic Cooperation and Development (OCDE) or just in the European Union (EU), thus limiting the scope of research questions. In terms of the institutional design of agencies, most empirical studies have mainly analyzed single dimensions, being independence (Gilardi 2002, Gilardi 2005b, Gilardi 2008, Hanretty and Koop 2012, Maggetti 2007) and accountability (Biela and Papadopoulos 2014, Koop 2015), the ones most discussed.

Our paper engages with these recent studies. Still, we seek to improve on these contributions in three respects. First, the territorial scope of our database goes beyond OECD and EU countries and provides a wider perspective of the regulatory state. This will overcome the shortcomings of previous databases on regulatory agencies, which have severely limited our understanding of the expansion of regulatory agencies in the developing world. Secondly, the paper builds on four different institutional dimensions, thus offering a broader picture than databases concentrating on a single dimension – i.e. independence – while allowing for the identification of some other interesting

variations for the study of the regulatory state. Finally, it elaborates a typology of regulatory agencies, based on a cluster analysis of the four dimensions identified. Our purpose is to provide a better understanding of the different roles agencies play in regulatory governance over the world, introducing a new perspective on their nature and potential in different settings.

The paper is organized as follows. Section 2 discusses the nature of our agencies' dataset and the main dimensions identified. Section 3 describes the process of acquiring data on the characteristics of agencies and the challenges faced when configuring the database. Our analysis of the variations of regulatory agencies is discussed in Section 4, whereas Section 5 presents the agency typology derived from cluster analysis. Finally, we conclude.

## **2. Context and interpretative framework**

Regulatory agencies have proliferated across sectors and countries around the globe (Jordana et al. 2011), emerging as an institutional expression of state adaptation to the governance age. The establishment of agencies contributed to the popularization of regulatory instruments and the implementation of broad regulatory reforms in many countries worldwide (Jordana and Levi-Faur 2004; Levi-Faur and Jordana 2005). In this sense, as the establishment of regulatory agencies was exposed to different economic, political and administrative contexts, we wonder to what extent their designs show different institutional and organizational configurations. In fact, this is one of the main reasons for the dataset. Exploring if such variations raise new questions calls for a finer conceptualization of contemporary state transformations in the era of regulatory capitalism.

A first effort in developing a dataset for the comparative study of regulatory agencies is Gilardi (2002). He focuses on the formal independence of agencies, inspired by economists measuring the independence of Central Bank regulators (Cukierman et al. 1992). Gilardi uses five indicators to measure formal independence, and generates scores for 27 institutions in 7 countries and 5 sectors. To justify measurement validity, this author refers to Adcock and Collier (2001) (i.e. the validity of measures has to be assessed only against the systematized concept, rather than against the discussion about whether independence may mean something else theoretically).

Then, in a revision in 2005, Gilardi improves his previous work by adding more variables to elaborate his index (up to 25), and increasing the number of countries to 17 Western European countries, with a total of 106 agencies. Gilardi's index (2005a) has been used as a departure point for many other minor improvements in independence measurement (i.e., Guardiancich and Guidi 2016). However, the most comprehensive measurement of regulatory institutions so far is from Hanretty & Koop (2012). They incorporate some improvements from previous research: a) the number of agencies

increases to 502 organizations; and b) they explicitly perform a measurement model to combine the information of the different variables avoiding simple means or ad-hoc scores.

In this research note we build on this previous research to improve the accuracy on the measurement of institutional features of regulatory agencies, providing significant improvements from previous research. Improvements include the nature of sampling, as our data comes from a systematic review of documents that ensures comparability and, the assessment of the multidimensional nature of agencies (not focusing on a single theoretical dimension, as for example independence). Additionally, we contribute some methodological innovations by deploying a measurement model with explicit treatment for missing data. Below we present a more detailed discussion of these improvements.

First, we systematically include all agencies from a pre-specified set of spaces defined by 115 countries and 17 sectors, making the comparative effort more coherent. We identified 800 agencies covering 1114 country sector spaces, a 57% of all possible cases. Whereas Hanretty & Koop (2012) rely on self-administered surveys sent to agencies, in our paper we analyze primary information directly. We believe this is a better approach for comparative purposes when looking into the formal design of regulatory agencies. We assured that the database is consistent and that the concepts are equally understood by all raters. The questionnaire was designed with comparative purposes in mind. We went to the data and back to the design of the database to ensure consistency and to reach highest comparability.

Second, we systematically develop a measurement model capable of coping with different types of variables, missing values and loss functions, and for explicitly assessing scores of agencies with fewer assumptions. In their paper, Hanretty & Koop (2012:200-201) identify several flaws in existing indices of formal (statutory) independence, being these mostly related to the fact that the proposed measures so far are simple indices based on aggregations of items, or pure means of scores. They use a mixed-response factor analysis as developed by Quinn in the R package MCMCpack. Instead, we employ a generalization of such model, coding it in JAGS and using Bayesian inference to avoid precisely such problem. We code our own measurement model, that incorporates IRT (for binary outputs), and FA (for continuous outcomes and ordinal outcomes where we also calculate the cutting points of every category), making our model a generalization of the one proposed by Hanretty & Koop (2012), as they do not fully take advantage of the Bayesian setup by incorporating an explicit loss function to the derivation of the latent scores. Only implicitly it can be understood the use of the mean of the posterior for extracting the score (a mean-squared loss function).

Hanretty & Koop (2012) deal with the problem of missing values by including an explicit parameter that models whether each item is present or not. Instead, we rely on a more general way to treat missing data. In our case, we align all variables to have higher values meaning higher independence. Then, when retrieving the sampled posteriors of the

scores of the agencies, we simply apply a loss function. In our case, we use a geometric loss function, which implies that the point estimate for every regulatory agency is the median of the posterior distribution. If we would like to apply a more conservative loss function to penalize missingness we could have used lower percentiles (say, 5th percentile), and then, agencies with larger uncertainty bands (those with more missing values) would score comparatively lower than those with narrower uncertainty bands (no missing values).

Third, we avoided measuring the degree of agency independence as a result of variations of different features of agencies. Our variables gave signals of more dimensions than simply agency independence, and proceeded accordingly. Just as Gilardi (2002, 2005a) and Hanretty & Koop (2012) do, we find that items relating to agency heads and boards have high weights in the final score of independence, whereas items relating to the running of the organization contributed less. We argue that this may be because these items were more relevant for a different dimension of agencies, and tried to identify it, instead of exhausting all the variations from our variables into the purpose of measuring a single dimension.

Our database focuses hence on different agency dimensions to capture their complex and polymorphic nature. These dimensions cover the main capabilities required to make agencies' tasks effective, based on their legal characteristics. Thus, we identify different concerns that are relevant for the study of regulatory agencies, while avoiding major overlaps. Based on existing theoretical approaches, we assess agencies with regulatory purposes across four basic aspects: regulatory responsibilities, political independence, managerial autonomy, and public accountability. Unfortunately, we do not cover other aspects of agencies, as for example their operational resources, or the results of their regulatory activities, as far as this would have required other sources of information.

To measure them, we create four latent dimensions by assigning different variables from our dataset to each of these topics and through factor analysis techniques. A latent dimension or a latent variable is an indicator of a concept that is not directly observable but rather measured and inferred using manifestations of several variables (see for example Treier & Jackman (2008) for a latent measure of democracy). We also use these latent dimensions to identify differences among agencies and to elaborate a cluster analysis that reveals the most common configurations. For example, there are cases in which independence is weak, but managerial autonomy strong; in other cases, agencies rely on strong independence but enjoy few regulatory powers, so much so that their formal independence becomes irrelevant. By not collapsing our data into one single latent dimension, we provide a much-nuanced understanding of regulatory agencies' contours and capabilities. Below we further discuss these dimensions.

Regulatory responsibilities. This dimension focuses on agencies' instruments, and questions how comprehensive and deep agencies' responsibilities are within a sector, asking how broad are their delegated powers? Are the agencies allowed to impose

sanctions? To what extent are these actions supervised and controlled, i.e. what power do the agencies have to issue and interpret regulations in policy areas? Do agencies have arbitrage capabilities? To answer these and similar questions, we focus on the substantive—rather than procedural—policy instruments that are granted to agencies to intervene in a specific policy area, as they are more comparable across countries and sectors (Baldwin et al. 2002, Lodge and Wegrich 2012)

Managerial autonomy. This dimension measures agencies' financial and managerial capabilities, and identifies the extent of the administrative separation between agencies and existing ministerial structures. Thus, the managerial autonomy of agencies implies three key areas: Human resources management, control on organizational structures, and authority over budgetary issues. How management procedures are set, how detailed executive controls are, or where budget resources come from, are some of the relevant issues for this dimension. The more autonomous control the agency exerts on these issues without external oversight, the stronger its managerial autonomy (Verhoest et al. 2004). It is important to note that our managerial dimension corresponds also to Gilardi's (2008) dimension of finances and organization in his broader index of agency independence.

Political independence. This dimension focuses on agencies' capabilities to decide on matters of their responsibility without political interferences. Here we observe the existence of formal rules that prevent agency board members and heads from being removed from their positions. Designed to create a protective environment, such rules may include fixed-term mandates, removal limitations, and legislative reviews, among others. Our variables are like those employed in two of Gilardi's (2008) dimensions of agency independence: "agency head and board" and "agency relations with politicians". In fact, such independence-related rules are employed to circumvent or to avoid or limit control by specific principals, i.e. the executive or the legislative, for practical reasons (efficacy) or normative ones (credible commitments). Overall, strengthening political independence rules represents a way of breaking the hierarchical logic predominant in the executive (Gilardi and Maggetti 2011, Thatcher 2002).

Public accountability. This dimension reflects the activities that agencies need to perform to justify their decisions and judgments. We build on Bovens' narrow definition of accountability (2007), describing a relationship between power-holders and those affected by their actions. Accordingly, we measure three different planes of agencies' accountability, focusing on how the agency accounts for its actions: First, whether the agency is hierarchically accountable to the executive and/or the legislature, secondly, whether agencies are accountable to their stakeholders, by means of different participatory mechanisms, and finally, whether the agency is accountable to the public in general (including the media), identifying several transparency procedures. As agencies having strong political independence and/or managerial autonomy may suffer of weak hierarchical accountability, we are also interested in examining if they develop

non-hierarchical forms of accountability. Thus, we observe how agencies strengthen their accountability through diversified mechanisms to pursue their goals of being broadly accountable for their activities (Bianculli et al. 2015, Scott 2001).

### **3. Research aims and dataset creation**

This paper provides an all-encompassing characterization of agencies with regulatory focus all over the world. To this end, we present our database and build a factor analysis model to characterize the commonalities and differences between agencies, while also discussing the globalization of the regulatory state in the final part of the paper.

#### **Database description**

The database was built on a non-nested structure or two-way cross-classification (Hee Park and Jensen 2007, Jordana and Levi-Faur 2005). We observe agencies in two overlapping categories of attributes: countries and sectors.

We chose 17 sectors to cover a wide range of policy areas where regulation is relevant including central banking, competition, electricity, environment, financial services, food security, gas, health services, insurance, pensions, pharmaceuticals, postal services, securities and exchange, telecommunications, water, work safety, and nuclear safety. Agencies operating in these sectors were selected according to the following criteria:

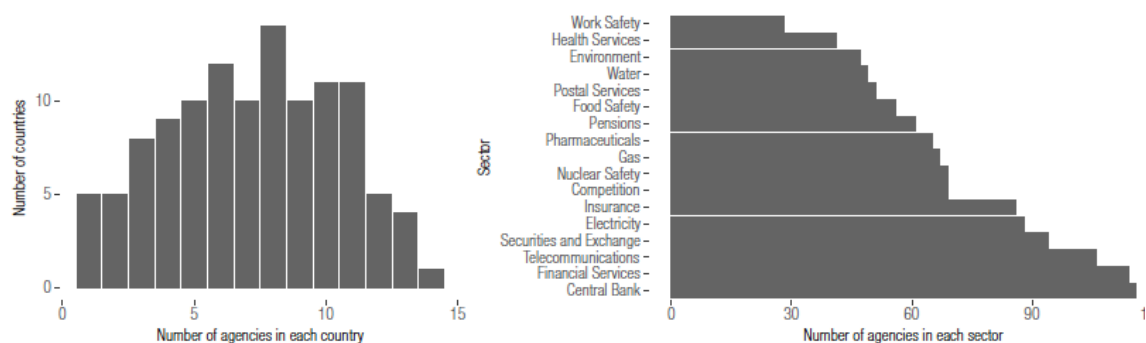
1. Focus on regulatory tasks, e.g. rule supervision, rule enhancement, and rule definition;
2. Stable entities created by public legal acts and which perform public tasks;
3. Organizational units formally separated from larger departmental and ministerial structures or from public bureaucratic frameworks;
4. Existence of public servants—whether tenured or not—and budgets under public control;
5. National scope (we excluded supra- and subnational agencies).

Based on these criteria, the database comprises 800 regulatory agencies in place in any of the 17 policy sectors selected in 115 countries, and which were operative on 31 December 2010. We included all countries with a population of more than 10 million inhabitants and/or a GDP level above current \$US100 billion. Some other countries were also included in the database to allow the study to cover specific regional integration initiatives: the EU, the Association of Southeast Asian Nations (ASEAN), the Andean Community (CAN), the Common Market of the South (MERCOSUR) and the Dominican Republic–Central America–United States Free Trade Agreement (DR-CAFTA). Figure 1 presents the distribution of agencies by country and sector in 2010. As can be seen, no country has only one agency for each of the 17 sectors considered in our study, nor is



there any country with no agencies. Many countries have established between 5 and 11 agencies, and very few have more than 11.

**Figure 1:** Distribution of the number of agencies by (a) country (actual number of agencies) and (b) sector (sector–country “spaces” covered by regulatory agencies).



To create a complete picture, the analysis brings together both the distribution by country and by sector, employing a two-way cross-classification to identify when a “space” is already covered by an agency (an agency can be associated with more than one sector and more than one agency can be active in a sector). The logic defines 1840 country–sector “spaces”, and we find 1114 of them already covered by autonomous agencies. This represents slightly more than 60% of the cases and goes beyond the 800 agencies identified. In fact, 23% of agencies take responsibility for two different sectors, 6% of them are responsible for three sectors, and the remaining 4% oversee four or more sectors (up to six). Interestingly, this confirms the idea that multi-sector agencies are a growing phenomenon in the regulatory world (Jordana and Levi-faur 2010).

The distribution of agencies by sector is also uneven (Figure 1). While central banks and agencies regulating financial services are present in almost all countries, in other sectors they are less frequent. For example, safety or health services agencies are present in fewer than 40% of the countries. Other sectors show a halfway pattern, as for example pharmaceuticals or competition policy, where agencies are already in place in about 60% of the countries considered. The approach by “spaces” also enables agencies that cover more than one country to be considered. These cases are very rare, and include the European Central Bank and a few examples in West Africa.

## **Variables and observations**

We included 43 variables related to different institutional and organizational aspects of the agencies in the dataset. Many variables are ordinal (without a specific numerical value, but with a set of ordered categories, e.g. the type of appointment), some are just binary (e.g. to capture whether the agency publishes its annual report online or not), and a few of them are continuous (as in the case of the term of office of the agency's head; see Annex for a list of variables).

Regarding those responsible for agencies' decisions, data collected included *de jure* provisions determining the appointment, renewal, and dismissal of agency heads and board members. We also coded the composition and specific functions of boards. To capture agencies' accountability, several variables identified the established mechanisms—namely, minutes of board meetings, agency resolutions, and annual reports. We also assessed agencies' specific obligations towards the executive and legislative.

The method used focuses on the formal dimension of the different variables. Indeed, to construct the database and gather observations for all variables, we consulted and analyzed laws, decrees and other legal documents available through national legal repositories, and ordinances and statutes available on agencies' websites. Where information was missing, we contacted the agencies directly. Formal *de jure* rules may not reflect *de facto* and informal processes and practices. Yet, assessing and understanding formal procedures and rules is relevant given that 'informality mainly takes place in the shadow of formal provisions'(Koop and Lodge 2017:1318). Moreover, the results of our database and analyses can be used in future research and be complemented with qualitative studies assessing the informal and *de facto* dimension of regulatory institutional arrangements and practices, through in-depth interviews and surveys.

At least three different coders analyzed the information for all agencies, and scores for all variables without missing information were agreed on by consensus. Similarly, discrepancies among coders (in a relatively small number of occasions) were resolved by research team discussions led by the principal investigator in order to reach consensual agreements. This process ensures that data collection is an integral part of theory building and reflects the variation found in the cases, not only the a-priori theoretical variation. This approach of iterative consensus building has been used, for example, to measure democracy (Bowman et al. 2005) and regional authority (Hooghe et al. 2016). Finally, and to be able to analyze and assess documents in the different languages, coders were knowledgeable in various languages, including Arab, Castilian, English, French, and Hindi. When needed, we also resorted to available translator toolkits.

To analyze the latent dimensions, we first have an overview of the values for each of the four dimensions, to assess how the variables selected contribute to defining them.

Regulatory capabilities. Having regulatory powers is a necessary condition for an agency to be included in the dataset. The dimension is captured by 14 variables (Table 1), including those focusing on regulatory powers such as whether the agency has the capacity to establish sanctions or decide on market entries or exits. All factor loadings of these variables were oriented so that higher values imply higher capabilities (see Online Appendix).

**Table 1 about here**

Managerial autonomy. This dimension included only 6 variables (Table 2); all of which contributed positively to it. Budget management was the focus of three different questions in our database. The first variable (budget approval) was to capture who approved the agency's budget. The second variable, on budget control, was aimed at determining who was responsible of auditing the budgeted. Finally, the question on budget income was intended to capture where resources came from. Regarding personnel issues, the first variable (personnel status) captured the status of agencies' employees; while personnel policy variable considered who was responsible for defining and establishing wages, incentives and promotions. Clearly, according to their factor loadings, personnel policy was the most relevant, whereas personnel status and budget approval were the least significant (see Online Appendix).

**Table 2 about here**

Political independence. This dimension integrates 12 variables (Table 3). They concern the rules governing the position of the agency head and board members, such as their appointment, removal, and dismissal. The variables related to provisions regarding the dismissal of agency heads and board members (or the prevention of this for policy reasons) and professional requirements for their appointment contributed the most to this dimension. Variables regarding the duration of the terms of office were also included, for example the duration of agency board membership.

**Table 3 about here**

Public accountability. This dimension integrates 11 variables (Table 4). Of these, one shows negative values in its factor loading: Whether the agency is accountable to the executive. This makes sense given that almost all the other variables looked into agencies' relationships with different audiences (the less accountable to the executive,

the more it is to the rest). In this respect, three variables showed the highest strength: whether the agency publishes its resolutions and annual reports online and whether it is accountable to Parliament (see Online Appendix). In other terms, we might interpret negative scores as a sign that hierarchical accountability to the executive prevails, while positive scores show that the agency is also accountable to the legislative, diverse stakeholders and the public.

#### **Table 4 about here**

In the next sections, we examine the variations regulatory agencies present over the world, either by country or by sector. To this purpose, we use several statistical methods, including factor and cluster analysis. The first step is to measure how agencies vary across each of the four latent dimensions. The second step is to examine the four dimensions we have identified, to observe if they vary in the same direction, or show inverse patterns.

### **4. Data analysis**

In the previous section, we identified which variables from our dataset are related conceptually to one of the four dimensions. We sorted these variables accordingly, and checked that higher values were aligned with higher expected values of the dimensions analyzed (see also Online Appendix). In this section, we detail how the four latent dimensions are devised from our raw data through factor analysis. The purpose of this analysis is to verify if establishing four dimensions for the analysis of regulatory agencies' variations makes sense, or if this is excessive, and using just one (or maybe two) is more appropriate. If the latter is correct, we should expect agencies' dimensions to show similar variations: if an agency has a weak value in the managerial dimension, this agency should be also weak in its independence dimension, as well as in its accountability dimension. If such a unidimensional pattern does not appear, then we should concede that introducing separate dimensions is useful to the analysis, as it would provide with a richer understanding of the variety of regulatory agencies everywhere.

Here we describe how we have constructed our four latent dimensions using factor analysis techniques, after having assigned a group of variables to each dimension. We have used Bayesian inference as it enables missing values to be incorporated and provides a uniform and flexible set-up for the model. The measurement model is shown in Equation 1:

$$\begin{aligned}
Y_{a,b} &\sim B(\pi_{a,b}) \\
\text{logit}(\pi_{a,b}) &= \delta_{b,1} * (\xi_a - \delta_{b,2}) \\
Y_{a,c} &\sim N(\mu_{a,c}, \sigma_c) \\
\mu_{a,c} &= \gamma_{c,1} + \xi_a * \gamma_{c,2} \\
Y_{a,o} &\sim C(\eta_{a,o}, \sigma_o) \\
\text{logit}(\eta_{a,o}) &= \alpha_{a,t} - \nu_{a,o} \\
\nu_{a,o} &= \lambda_{c,1} + \xi_a * \lambda_{c,2} \\
\delta_b &\sim N(0, 1) \\
\gamma_c &\sim N(0, 1) \\
\lambda_o &\sim N(0, 1) \\
\xi_a &\sim N(0, 1)
\end{aligned}$$

The model states that the latent trait is extracted from a combination of an Item-Response Theory model for binary variables (subscripts 'b', lines 1 and 2), where  $\delta_2$  are difficulties and  $\delta_1$  are discriminations, a continuous factor analysis (subscripts 'c', lines 3 and 4), where  $\gamma_2$  are the loadings of every continuous variable) and a factor analysis for the continuous representation of the ordinal variables (subscripts 'o', lines 5 to 7), where  $\lambda_2$  are the loadings and  $\alpha_{a,t}$  are the thresholds 't' for every category). The parameters of interest are the  $\xi_a$ , which represent the latent score of every agency (a) in a dimension. The model is repeated for each dimension.

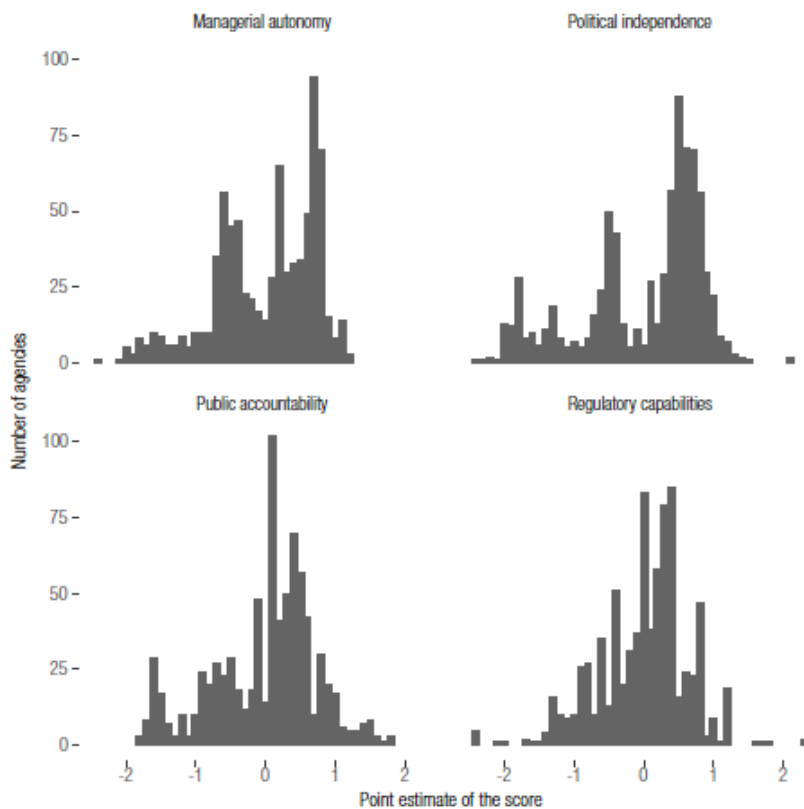
Finally, the model outcome (posterior distributions for the parameters of interest, namely the discriminations / loadings and the latent scores in each dimension) can be further processed using loss functions. We employed JAGS (Plummer 2003) to perform the sampling and *ggmcmc* (Fernández-i-Marín 2016) to assess convergence. The model is built up so that the scores have a prior mean of zero and standard deviation of one. The statistical process generates samples of the target distribution. First, the parameters of interest were the scores of the latent trait (as many parameters as there are institutions). Secondly, estimates for the factor loadings indicated how far a concrete variable was relevant for explaining variation in the latent score. Therefore, apart from learning whether each agency had a specific value for each of the four dimensions, it was also possible to assess which relevant variables provide information for the score.

For agencies with missing values, the resulting posterior distributions are wider than those for which complete information was available. As the dimensions are specified in such a way that higher values imply more complexity, we have used a loss function that penalizes institutions with missing values in a way that gives them lower final scores. Thus, under equal conditions, two institutions that differ only by the fact that one has a known value on a variable and the other has an unknown value, we prefer to penalize the second. Therefore, we have used the fifth percentile of the posterior distribution of the scores as the values of each of the agencies' position in every dimension, and these

values have been centered to ensure that an agency that scores zero can be interpreted as an agency having a value corresponding to the mean in that dimension.

From our factor analysis, we obtain values to identify how each agency is scored for each dimension. Then, we focus on how agencies' scores are dispersed along each dimension, to assess variations within each dimension. Figure 2 provides a preliminary answer as it depicts the distribution of agencies' scores for each dimension after the loss function has been applied and the values have been centered at the mean. First, regarding regulatory capabilities, most agencies are concentrated within the central zone of the dimension. There are, however, several outliers in both extremes of the scores. The distribution of agencies' scores for managerial autonomy displays values skewed to the higher end but some cases, in a long lower tail, indicate agencies with extremely low autonomy. The independence dimension is more polarized than the previous two. Three types of agencies are thus identified: those that have a value around 0 (about 60%), those with fairly low independence (scores around -1, about 25%), and those with very low independence (with scores around -2.5, about 15%). As to the accountability dimension, the distribution of agencies' scores seems to point to a smoother transition from highly accountable to least accountable agencies. Yet, there is a group of feeble accountable agencies at the lowest end of the distribution.

**Figure 2:** Histogram of the dimensions (value of agency means for each dimension).



To complete our analysis of the variation of agencies' scores, we need to measure their dispersion within each dimension. However, as we could not use standard deviations because these were assumed to be equal to one; we used a measure of distance between institutions within each dimension. By calculating how far an agency is from the rest and averaging these distances over each dimension, we could compare the level of agencies' score dispersion between dimensions. In other words, the dimension with the highest mean of distances is less compact. Using the Euclidean algorithm to calculate distances (the sum of the squares of the differences between institutions), we found regulatory capabilities to be the most compact dimension, with a mean between institution distances at 0.69. Public accountability and managerial autonomy had virtually equal means at 0.82, whereas political independence had a mean distance of 0.95. Thus, we find quite a significant diversity within each latent dimension. Yet, agencies appear to be most different in their political independence and most similar in their regulatory capabilities.

### **Variations across latent dimensions**

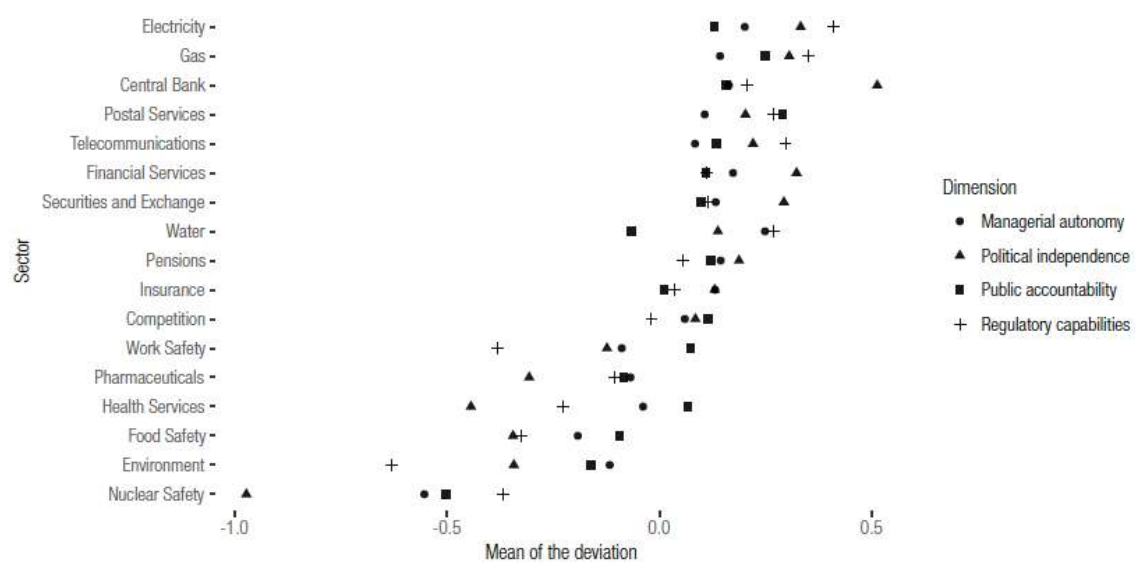
After examining how similar agencies are within each of the four dimensions, we now examine correlations among the four latent dimensions. If they correlate strongly, we would need to revise the rationale of such dimensions. However, correlations among dimensions are weak in general, thus showing that each dimension captures different aspects of the nature of regulatory agencies (see Table 1). Results exhibited only some correlation between independence and accountability (0.42), autonomy (0.40) and capabilities (0.35). However, when we observe score means for countries across each dimension, we find a rather stronger positive correlation between political independence and regulatory capabilities (0.53), and accountability (0.53). Correlations of score means for sectors are even higher, indicating that some dimensions in each sector vary similarly. For example, political independence aligned well with accountability (0.84), but also with regulatory capabilities (0.80) and managerial autonomy (0.93). However, we should note that these correlations are based on 17 observations, thus limiting the strength of the conclusions we may deduce. It is worth highlighting that sectors vary more similarly than countries. In other words, agencies within the same sector are more similar in their scores on every dimension than to the rest of agencies.

**Table 5 about here**

Given the strong correlations of means for sectors, more detail is needed on the variations of the four latent dimensions across the 17 sectors. Recall that the scores produced are expected to have a zero mean and standard deviation 1. Therefore, an agency that scores -2.5 in its political independence dimension implies a very low score (hence, very low political independence). Figure 3 presents means of the deviations between the score of each regulatory agency sector and the center of each dimension. It shows that agencies operating in the financial and utilities sectors scored higher in most dimensions, in contrast to those in the risk and social areas, which often showed lower scores. This can be observed in some sectors (e.g. nuclear, environment, health), which deviated greatly for some dimensions, i.e. independence and regulatory capabilities, meaning that these have partly divergent institutional patterns. However, some dimensions deviated more than others. Of particular note are central banks, which showed extreme positive deviation in political independence, whereas nuclear safety presented an extremely negative deviation in the same dimension. More generally, accountability (0.55) displayed less dispersion across sectors than political independence (0.73), whereas the dispersion values of managerial autonomy stood between them (0.60). Regulatory capabilities revealed the lowest (0.52).

We do not report deviations for each country due to space constraints (see Online Appendix). However, an interesting effect can still be perceived in this respect: countries with lower (mostly negative) mean deviations also displayed greater differences among the scores they obtained for each dimension.

**Figure 3.** Deviations for sector scores compared with the center of each dimension





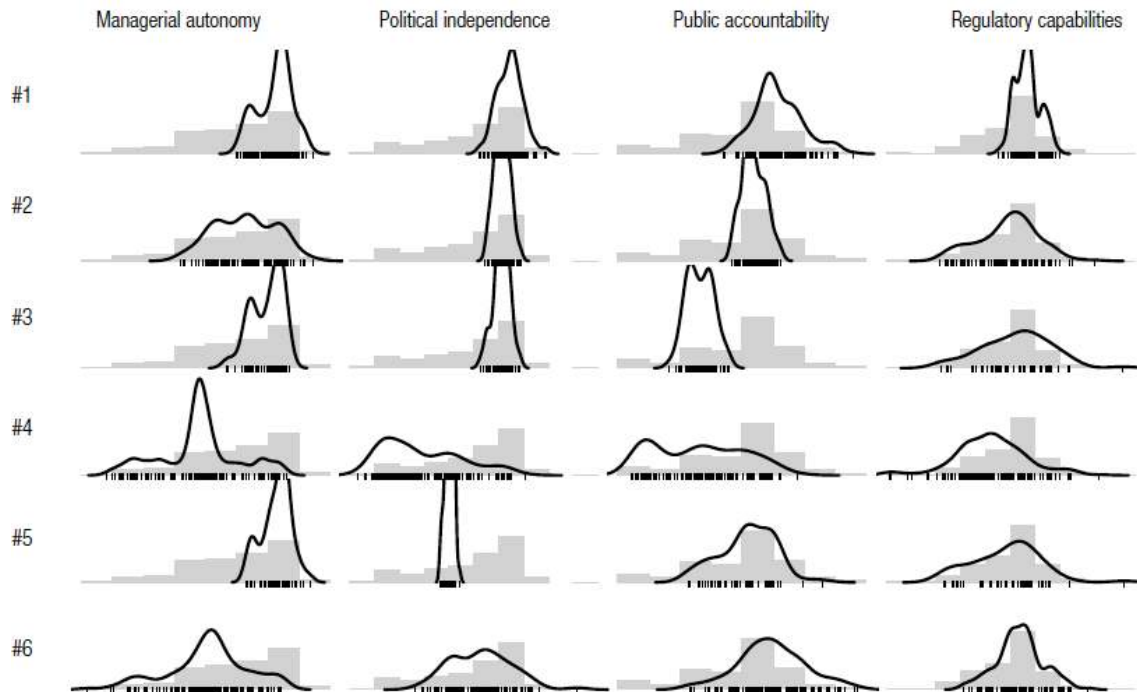
In sum, we observed that agencies' dimensions are not well-correlated. Evidence does support clearly our expectation about the importance of defining separate dimensions for the analysis of agency variations. Moreover, this result shows that when classifying agencies, it is vital to consider different dimensions to avoid serious information loss. However, we also found that certain sectors and, to a lesser extent, countries, tend to have more similar agencies than those in other sectors and countries, for each dimension. These results suggest that similarities and differences among agencies are complex and require further scrutiny, if we aim to identify varieties of regulatory agencies. We explore this problem through cluster analysis in the next section.

### **5. Towards a typology: Clustering groups of agencies**

Cluster analysis allows us to assess whether there are natural ways in which agencies in our dataset tend to aggregate within the four dimensions. We perform an analysis of the associations between dimensions to identify groups of agencies that are most similar across all four dimensions. For example, cluster analysis will help us assess whether and to what extent some agencies tend to have more positive score values in all dimensions. Hierarchical clustering using different models at the level of single agencies suggests that the maximum level of fitness is reached when we define eighth groups (see Online Appendix). However, the final model we select for our analytical purposes, segregates the 800 agencies into six clusters. The reason for this is that estimation differences are very low, while the two additional clusters increase complexity without adding meaningful information (see Online Appendix, Figure 3). Our analysis here is limited to unravel the variety of agencies' institutional patterns. We have thus avoided exploring exogenous variables that could explain the levels of variation in each latent dimension.

Figure 4 shows the distribution of agencies across each dimension, cluster by cluster. Thus, we can scrutinize these clusters in detail, and identify which composition emerges out of each one. We identify some meaningful compositions, which might help to make sense of the existing variations among agencies. Ideally, it will also help to establish a typology of regulatory agencies, taking as a departure point some models defined in the literature; in particular, the independent agency model that has prevailed in academic debates about regulatory agencies in recent decades. The model prescribes high level of managerial autonomy and high political independence, together with broad accountability mechanisms (i.e., OECD 2014). Thus, we could start by searching if the dominant model in the literature is captured by one or more clusters.

**Figure 4:** Distribution of agency scores in each cluster, by dimension



We observe that cluster #1 concentrates those agencies closer to the ideal of the independent agency model. They are separate from the executive and the legislative and exhibit high political independence and low managerial control, as well as good levels of downwards accountability. However, this cluster contains fewer than 22% of all regulatory agencies. Other clusters include agencies with high political independence, but in all these cases isolation is not completed. For example, agencies in cluster #2 display strong political independence but medium levels of managerial autonomy. We could interpret this cluster as one in which the executive retains significant control over the agency organizational apparatus. To a certain extent, this cluster shows that the executive ties their hands regarding agency decisions, while keeping some controls on the managerial side, whereas accountability shows lower scores than in cluster #1. Still, cluster #3 can be perceived as a less “perfect” variety of cluster #1. It groups agencies with political independence and quite autonomous in managerial aspects, but which are accountable only to the executive and enjoy looser regulatory powers. This cluster could include many cases of symbolic emulation, following the appropriateness of the independence rule that prevailed in many sectors. Thus, we suggest these three clusters include all agencies that follow the independent agency model. Still, they exhibit three different sub-types, which could be labelled as the “ideal” sub-type (cluster #1), the “constrained” sub-type (cluster #2), and the “mimetic” sub-type (cluster #3).

However, these three clusters represent only about 47% of all agencies, showing that the remaining agencies do not follow the independent agency model. Thus, which are the characteristics of the other agencies? Do the other clusters suggest different institutional models for regulatory agencies? If we observe cluster #4, which includes 27% of all agencies, we find low political independence levels and low managerial autonomy. This means that the executive retains strong control, both managerial and political, as a key component of the agency design. This configuration suggests that cluster #4 groups regulatory agencies do not have any type of independence. Cluster #5 can be taken as a variety of the previous model, as it includes agencies with relatively strong managerial autonomy but weak political independence. Most probably, agencies in this cluster are public entities hierarchically dependent on their 'parent ministry', having significant degree of administrative autonomy. Finally, cluster #6 contains a group of agencies not very different from cluster #4, though, showing higher levels of political independence (although lower than levels in clusters #1 to #3). However, managerial autonomy scores as in cluster #4, and accountability is similar to cluster #5. It appears that the three former clusters follow a similar agency profile, non-politically independent from the executive. Thus, we might label cluster #4 as the "dependent" sub-type, showing close linkages to the executive in all dimensions. Clusters #5 and #6 represent interesting varieties within the non-independent pattern. The former might be labeled as the "autonomous" sub-type because of its strong managerial autonomy, whereas the latter may be termed the "responsible" sub-type given its accountability level and political independence.

Table 6 shows how agencies are distributed across clusters, and more particularly, how some clusters massively concentrate agencies from different countries and sectors. To read this table, it is important to observe the first column, which refers to the number of agencies across clusters, and then to look at the other columns to see whether the proportion is higher or lower for the same cluster based on the sectors of agencies, or the country to which they belong. In this sense, we observe that clusters #1, #2 and #3 show a lower presence in those sectors where agencies focus on risk regulation, while it is the opposite for clusters #4 and #5. Thus, it becomes clear that the independent regulatory agency type has become dominant for market regulation but not within risk regulation sectors.

### **Table 6 about here**

As to the distinction between developed and developing countries –using OECD affiliation as a proxy- we find that clusters #1 and #6 are extra-populated by OECD countries, whereas the contrary holds for clusters #3 and #4. As has already been said, the first cluster is following the independent agency type, in particular the "ideal" sub-

type, whereas cluster #6, which we label as the “responsible” one, belongs to the non-independent type, even if it exhibits strong accountability levels. It is also interesting to note that agencies in cluster #3, the “mimetic” sub-type, are largely overrepresented in developing countries.

## 6. Concluding remarks

Based on the analysis, three main findings are worth highlighting. First, agencies are dissimilar across each dimension, having relevant internal variations. Furthermore, agencies’ latent dimensions display very weak correlations, which confirms the relevance of introducing several dimensions in the analysis to better understand their role in regulatory governance. The weaker correlations of means for countries among different dimensions reveal that there are not strong, distinctive national patterns for regulatory agencies. However, stronger correlations of means for sectors may just reflect the fact that the independent regulatory agency model is concentrated in some sectors but has not expanded to all sectors where there are regulatory agencies. Our cluster analysis also confirms this finding and opens the door to further studies considering more nuanced distinctions as to the characteristics of regulatory agencies.

Secondly, based on the cluster analysis, we find that only about half of the agencies identified in our dataset display combinations of institutional characteristics that remain loosely connected to the independent agency type. Among the rest, some combinations are highly peculiar. In all, our study reveals ample evidence that traditional models of administrative organization have also inspired the institutional design of a large share of regulatory agencies in recent decades. Having said this, our suggested typology of regulatory agencies allows us to identify some relevant sub-types. Exploring the performance and the shortcomings of each sub-type is something beyond this research note; but here again, further studies could assess the governance capabilities of each sub-type.

Thirdly, we also confirm that the agencies considered in our dataset are comparable since they all have regulatory responsibilities –and this is the dimension showing the least dispersion. This enables regulatory agencies to be compared as a category within the realm of public agencies. However, their internal differences also call for careful examination. As we aimed to elaborate different dimensions to identify agency characteristics, we have suggested a potential for researching on institutional challenges of agency design.

Overall, our findings show that the whole universe of agencies entails significant richness and diversity, even when we only observe its formal nature. Thus, it is important to discuss how different economic and political variables that interact with agency dynamics contribute to improve their performance, or to the contrary, create gridlocks and other grievances. Further research could produce potential explanations

about the nature of the differences identified here. At this point, however, we may conclude that the regulatory agency has become a global institution, which has been adapted to very different contexts, employing a variety of tools for its design. Thus, the global regulatory state exhibits different, and puzzling, institutional forms everywhere.

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**Table 1: Variables for regulatory capacities**

<b>Variable</b>	<b>Type</b>	<b>category</b>	<b>value</b>
Capacity to promote conflict resolution	binary		
Capacity to do research	binary		
Capacity to elaborate norms	binary		
Capacity to establish market entries and exits	binary		
Capacity to establish prices	binary		
Capacity to implement sanctions	binary		
Capacity to supervise	binary		
Revision decisions - Judiciary	binary		
Revision decisions - Minister	binary		
Revision decisions - None	binary		
Revision decisions - Other regulatory agency	binary		
Revision decisions - Parliament	binary		
Revision decisions - President - Prime Minister	binary		
Regulatory competencies in the sector	ordinal	1	Without competencies, only consultation
		2	Shared with the government
		3	Shared with the parliament
		4	Shared with other agencies
		5	Agency

**Table 2: Variables for managerial autonomy**

<b>Variable</b>	<b>Type</b>	<b>category</b>	<b>value</b>
Budget approval	ordinal	1	Ministry
		2	Parliament
		3	Agency
Budget control	ordinal	1	Ministry
		2	Parliament
		3	Separate accounting office
		4	Agency
Budget income	ordinal	1	Ministry budget
		2	Only public budget
		3	Regulated firms and public budget
		4	Regulated firms
Organizational structure	ordinal	1	Government
		2	Agency and the government
		3	Agency
Personal status	ordinal	1	Public servants / functionaries
		2	Mixed regime
		3	Employees under public regulation
		4	Employees under private regulation
Personnel policy	ordinal	1	Government
		2	Agency and the government
		3	Agency

**Table 3: Variables for political independence**

Variable	Type	category	value
Agency board membership professional requirement	Binary		
Agency head professional requirement	Binary		
Agency board term of office	continuous		
Agency head term of office	continuous		
Agency board membership appointment	Ordinal	1	Minister
		2	President - Prime Minister
		3	Executive Collectively
		4	Legislative-Executive
		5	Legislative only
		6	Board
Agency board membership dismissal	ordinal	1	No provision
		2	Related to political changes
		3	Only for non-policy reasons
		4	Not possible
Agency board membership renewal	ordinal	1	Possible, but not defined / Not limited
		2	More than once
		3	Once
		4	Not possible
Agency head appointment	ordinal	1	Minister
		2	President - Prime Minister
		3	Executive Collectively
		4	Legislative-Executive
		5	Legislative only
Agency head dismissal	ordinal	1	No provision
		2	Related to political changes

		3	Only for non-policy reasons
		4	Not possible
Agency head renewal	ordinal	1	Possible, but not defined / Not limited
		2	More than one
		3	Once
		4	Not possible
Current legal instrument	ordinal	1	Ordinance and other lower norms
		2	Decree, Executive decree
		3	Law
		4	Constitution
Holding offices in government	ordinal	1	Required for all members
		2	Required for some members
		3	Not specific provisions
		4	Not allowed

**Table 4: Variables for public accountability**

<b>Variable</b>	<b>Type</b>	<b>category</b>	<b>value</b>
Annual reports are online	binary		
Civil society accountability - Advisory council	binary		
Civil society accountability - Consumers' office	binary		
Civil society accountability - Open consultations	binary		
Civil society accountability - Other	binary		
Civil society accountability - Public hearings	Binary		
Minutes are online	Binary		
Resolutions are online	Binary		
Accountable to the executive	Ordinal	1	Not accountable
		2	Information only
		3	Approval of annual report
		4	Fully accountable
Accountable to the ministry	Ordinal	1	Not accountable
		2	Information only
		3	Approval annual report
		4	Fully accountable
Accountable to the legislative	ordinal	1	Not accountable
		2	Information only
		3	Approval annual report
		4	Fully accountable

**Table 5: Correlations between latent dimensions**

<b>Correlation Pair</b>	<b>Single Agencies</b>	<b>Country mean</b>	<b>Sector mean</b>
Managerial Autonomy: Political Independence	0.40	0.47	0.93
Managerial Autonomy: Public Accountability	0.20	0.40	0.81
Political Independence: Public Accountability	0.42	0.53	0.84
Managerial Autonomy: Regulatory Capabilities	0.22	0.39	0.77
Political Independence: Regulatory Capabilities	0.35	0.53	0.80
Public Accountability: Regulatory Capabilities	0.29	0.43	0.66

Note: Column 'agencies' refers to the correlations between each of the 800 agencies. Column 'Country mean' refers to the correlations between the means of the 115 country agency scores. Finally, column 'Sector mean' refers to the 17 mean scores for sectors.

**Table 6. Percent distribution of agencies across clusters**

Cluster #	Number of agencies	% of all agencies	% risk regulation agencies	% economic regulation agencies	% agencies in OECD countries	% agencies in non-OECD countries
# 1 “Ideal”	<b>171</b>	<b>21%</b>	7%	28%	28%	17%
# 2 “Constrained”	<b>134</b>	<b>17%</b>	11%	19%	18%	16%
# 3 “Mimetic”	<b>70</b>	<b>9%</b>	6%	10%	2%	13%
# 4 “Dependent”	<b>213</b>	<b>27%</b>	46%	17%	17%	33%
# 5 “Autonomous”	<b>66</b>	<b>8%</b>	13%	6%	10%	7%
# 6 “Responsible”	<b>146</b>	<b>18%</b>	17%	19%	25%	14%