HOW DO FEDERAL BUREAUCRATS GET INFORMED? AN X-RAY OF THE SOURCES OF EVIDENCE USED IN POLICY WORK

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1 INTRODUCTION

The use of scientific knowledge to support policy has been a debated issue since the emergence of the field of policy analysis (Lerner and Lasswell, 1951; Weiss, 1979). More recently, the evidence-based policy approach (EBP) resumes and extends this debate by advocating for public decision-makers to use scientific evidence about "what works" to improve policy.

On the one hand, EBP renews belief in the precepts of instrumental rationality and scientific neutrality as the foundation of policy decisions (Davies, Nutley and Smith, 2000). However, on the other hand, it catalyzes criticism from different analytical schools, such as the argumentative and post-structuralist ones, which provide the basis for different arguments about what would inform and provide the basis for policy.

This chapter seeks to explore some of these arguments. The first relates to the recognition of non-linearity and the rejection of the stagist model of the process of policy production. As empirical work in the area of policy implementation has revealed, policy production is not a linear and unidirectional process that begins with policy formulation and ends with policy delivery. Instead, multiple actors, instruments, and contextual factors interact and affect each other in policy production,

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generating distinct effects, even different from those expected in the original policy conception (Pressman and Wildavsky, 1973; Pires, 2018). Following this understanding, we maintain that knowledge of not only what informs policymakers at the moment of formulation but also what informs the distinct "policy workers" (Colebatch, Hoppe and Noordegraaf, 2010, p. 7) in their diverse contexts of action becomes highly relevant to understand this set of informational interactions that shape the process of policy production.

The second argument that we also seek to explore in the analysis deals with broadening the understanding of evidence beyond scientific evidence. The critical policy literature points out the significant limitations to the instrumental use of scientific evidence (Simon, 1956; Lindblom, 1959; Weiss and Bucuvalas, 1980; Cairney, 2019) and the importance of other factors for the production of policy, such as the historical contingency proper to social phenomena; the interests, values, and motivations of actors; and the interactive reflexivity among actors and between actors and objects (Fischer and Gottweis, 2012; Lejano, 2006; Spink, 2019; DeLeon, 2008; Yanow, 2000). In this sense, scientific evidence should be conceived as just another of the possible meaning-validation frameworks for policy production (Williams, 2010).

Indeed, national and international empirical work has shown that scientific evidence is not among the tools most used by bureaucrats (Veselý, Ochrana and Nekola, 2018; Cherney et al., 2015; Newman, Cherney and Head, 2017; Enap, 2018; Macedo, Viana and Nascimento, 2019; Koga et al., 2020). Also, bureaucrats' actions, including in analytical work, do not take place in isolation but in interaction with policy stakeholders, and therefore they are influenced and informed by other forms of knowledge brought in by them (Colebatch, Hoppe and Noordegraaf, 2010).

We claim that these findings of empirical studies dialogue with the proposal of Pinheiro (2020b) of a moderate model for understanding evidence, which recognizes that the choice and use of the type of informational tool are conditioned to the specific contextual framework of use. Using such a proposal, in this chapter, we seek to provide an x-ray of the use of evidence sources by bureaucrats and to empirically analyze how factors that configure the context of bureaucrats' performance relate to evidence sources for the production of policy. In particular, the different types of policy work and capacities.

To this end, we analyze the results of a survey conducted by Ipea, between October and December 2019, with a sample of 2,180 individuals from the universe of nearly 100,000 civil servants of the direct public administration who work in various areas and ranks in policy production (Koga et al., 2020).

The initial studies of the survey pointed out, among other results, the existence of four types of jobs in federal policies: i) analytical/control; ii) relational; iii) contract/supervision; and iv) administrative. In addition, it brought data on four main types of evidence used by the respondents as a whole (Koga et al., 2020):

- internal – standards, technical notes, recommendations from control bodies, government databases etc.;

- external non-academic – journalistic reports, recommendations from participatory instances, information from interest groups etc.;

- external academic – articles and scientific research; and

- experiential – personal experience and consultation with colleagues.

This chapter is structured in five sections, in addition to this introduction. In section 2, we discuss the literature on the moderate model of evidence and factors that would configure the context in which federal bureaucrats act, especially the type of work they perform and their analytical capacities. In section 3, we present our analytical model for exploring the use of the kinds of information in the production of policies as a function of the factors that express the context in which federal bureaucrats operate. In section 4, we expose the methodology and the variables that represent the elements of the proposed analytical model (*policy work*, *individual analytical capacity*, *organizational analytical capacity*, *policy area*, and *individual characteristics*). In section 5, we present and discuss the results of the analysis. Finally, in section 6, we bring the conclusions and the implications of these results.

2 THE USE OF EVIDENCE IN THE CONTEXT OF BUREAUCRATS' PERFORMANCE: TYPES OF WORK AND CAPACITIES IN POLICY

The EBP approach resumes and extends the traditional debate in the policy analysis literature on the role of scientific knowledge and instrumental rationality in policy (Lerner and Lasswell, 1951; Simon, 1956; Lindblom, 1959; Weiss and Bucuvalas, 1980; Fischer and Gottweis, 2012; DeLeon, 2008). EBP emerged as one of the central elements of the Tony Blair administration in the United Kingdom, elected in 1997, which advocated the agenda of "what matters is what works" as opposed to the "conviction politics" that characterized the administration of his predecessor Margaret Thatcher (Davies, Nutley and Smith, 2000). Despite EBP advocates' recognition of the limits of instrumental rationality and the non-linearity between the process of scientific knowledge production and practice in policy, the normative precepts of the rationalist approach, such as the separation between technique and policy, the hierarchy of evidence, and the belief in scientific neutrality, remain underlying in this pragmatic pursuit of the best possible inputs for conducting policy (Cairney, 2019; Oliver et al., 2014; Parkhurst, 2017).

Pinheiro (2020a; 2020b) highlights that the very definition of evidence is disputable in this debate. On one extreme, grounded in the rationalist paradigm, is the idea of evidence as the result of rigorous and systematic scientific production. However, other factors derived from constructivist approaches are recognized as relevant for decision-making and policy production along this spectrum. Given the non-existence in the specialized literature of systematic characterization of evidence in policies and considering the accumulation in the field, Pinheiro (2020b) proposes a moderate model between the two extremes. That is, between a radical perspective of the rationalist model that would disregard the complexity inherent in the decision-making process, characterized by non-linearity, uncertainty and multicausality, and a radical view of the constructivist model that would make it impossible to propose general propositions and the pragmatic use of evidence to produce analysis and evaluation of policies.

Starting from a dialogue with North American pragmatism and the "second" Wittgenstein's philosophy of language, Pinheiro's (2020a; 2020b)[7] moderate model seeks to extract learnings from the rationalist and constructivist models critically and proposes that use within a contextual frame is the characterizing element of an informational tool in evidence. That is, the contextual frame would condition the use of informative instruments and their conformation and recognition by users as evidence. According to Pinheiro (2020b, p. 23), such a framework would be composed of three main types of factors that intertwine:

> i) politicians – the temporality of politics, its ideological commitments, and its disputes over power and democracy; ii) epistemologies – the evaluation of policy, uncertainty, the reflexivity of social knowledge etc. (Mulgan, 2005, p. 224[8] apud Pinheiro, 2020b, p. 23); and iii) normative, institutional, and organizational.

This section aims, therefore, to review and discuss the literature that addresses the context in which bureaucrats operate, especially the work done regarding policies in modern public administrations. Furthermore, the objective is to associate the type of activity of bureaucrats with other contextual factors that may be presented as conditioning agents for using specific informational instruments by bureaucrats, such as the analytical capabilities necessary to develop this work, the areas of policies, and individual characteristics. Finally, it is worth noting that, although we recognize that the literature brings several factors that may characterize different contextual frames of the bureaucrat's work, this research will seek to focus on the debate about the policy work and analytical capacity, as these are factors analyzed more intensely by recent international literature and still little explored in Brazil.

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7. For details on this study, see Pinheiro (2020a; 2020b).
8. Mulgan, G. Government, knowledge and the business of policy making: the potential and limits of evidence-based policy. *Evidence & Policy*, v. 1, n. 2, p. 215-226, 2005.

Defining policy work is not a trivial task. Besides the difficulty of drawing common concepts for different political-institutional contexts, to allow a comparison, there are substantive differences depending on the definition of the policy process used (Colebatch, 2006). Another primary element is the type of attachment to the public apparatus, as policy appointments would focus on "familiarization with standard technical tools such as supply-demand, cost-effectiveness, and cost-benefit analysis, along with the study of cases, workshops, simulations, or real-world projects" (Howlett and Wellstead, 2011, p. 615). Other forms of insertion in the field of policy, including the performance of generalists, would be related to a more appropriate "political" performance. However, would the actual operation of contemporary public administrations allow for this interpretation?

Recent research has pointed to a less dichotomous view of professionals working in government. For example, Howlett and Wellstead (2011), based on a comprehensive survey of the Canadian subnational bureaucracy, argue that the analysts interviewed perform nine different functions, including formulation, implementation, communication, database management, and legal analysis, which can be grouped into four main types of functions in policy: i) presentation of options and courses of action; ii) implementation; iii) advising and consulting; and iv) policy evaluation. Consequently, there is a relevant variation in the techniques used, the interaction format with internal and external actors, and the different policy issues involved in these professionals. Similar scenarios, pointing to diversity in the types and designs of insertion in the public apparatus, are observed in contexts as diverse as the Canadian federal government (Wellstead and Stedman, 2010), the Czech Republic (Veselý, 2014), the Philippines (Saguin, Ramesh and Howlett, 2018), the Netherlands (Hoppe and Jeliazkova, 2006), and Brazil (Filgueiras, Koga and Viana, 2020).

In this same vein, other empirical studies have shown that analytical policy work, in general, occurs associated with other work, like those of a "relational" type, such as intergovernmental negotiation, public consultations, translation, and even democratization functions (Meltsner, 1976; Colebatch, Hoppe and Noordegraaf, 2010; Kohoutek, Nekola and Novotný, 2013; Olejniczak, Raimondo and Kupiec, 2016). The possible permeability of diverse sources of knowledge brought in by the different actors participating in policy (Colebatch, Hoppe and Noordegraaf, 2010) with whom the bureaucracy interacts in its work must be acknowledged (Cairney, 2019). This relational approach has already been recognized and explored in research on the Brazilian federal bureaucracy, especially at the federal level (Cavalcante and Lotta, 2015; Pires, Lotta and Oliveira, 2018).

Another concept used in studies on bureaucrats and public organizations concerns policy capacities, which can be defined as the set of skills and resources needed to perform functions and produce policies (Wu, Ramesh and Howlett,

2015). As evidenced by Filgueiras, Koga and Viana (2020), the concepts of capacity and policy work are mutually related. Capacities, insofar as they are accumulations of resources and skills, condition the performance of work. In other words, the performance of certain functions in policies requires structural conditions to do so. In turn, the existence of skills and resources is useless if they are not activated. Work allows capabilities to be deployed, developed, and transformed.

As Wu, Ramesh and Howlett (2015) point out, the performance of policy functions by bureaucrats and public organizations demands different kinds of capabilities, such as administrative, relational, and analytical. For the discussion in this chapter, we are interested in capabilities in their analytical dimension, which refers more specifically to "knowledge acquisition and its use in the processes developed in policy" (Howlett, 2009, p. 162). The specialized literature takes the analytical capacity of both bureaucrats and public organizations as a fundamental condition for enabling the flow of intelligence about and for policies to policy decision-makers (Olejniczak, Raimondo and Kupiec, 2016).

Three dimensions seem to be relevant to thinking about analytical capacities. The first refers to the processing of evidence: data collection; reading and analysis of scientific research; formulation of models and use of statistics; applied research; evaluation of mechanisms associated with achieving goals; and program design. The second consists of communicating messages related to the policy itself: the ability to articulate medium- and long-term priorities; consulting, and relationship management. The third concerns, more specifically, the resources associated with obtaining and processing analytical elements: technical quantity and quality of professionals working in government organizations; budget; access to external networks of experts, and knowledge production (Howlett, 2009). In other words, as Howlett (2009) suggests, analytical capacity is related not only to the appropriation, use, and dissemination of scientific knowledge but also to the other sources of knowledge that circulate in the process of producing a policy.

Among the empirical studies that mobilize analytical capacities is the work of Wellstead, Stedman and Howlett (2011), who analyze Canadian federal bureaucrats allotted in the capital and the provinces, and sub-national government employees. The authors argue that the nature of the tasks performed by bureaucrats is related to their attitude toward the workings of government – street-level bureaucrats involved in short-term emergency activities perceive analytical skills as low quality – as well as their involvement with the work performed in policy. These factors are more relevant than the level of government at which bureaucrats perform their functions.

It is important to consider individuals, organizations, and the policy subsystem as units of analysis in studies of analytical capacities. For example, Elgin and Weible (2013) combine aspects of the analytical capacities discussion with the Advocacy Coalitions Framework to understand Colorado's energy and climate

policy subsystem. By contrasting the actions of two coalitions – for and against the climate change thesis – the authors argue that the profile of the participants and their strategies in the policy subsystem were similar, even though the coalitions were completely opposite in their objectives. Both had individuals with good education, experience, and formal educational background in technical skills, and organizations were relatively capable of regulating strategies to advocate their views. The coalition favoring the climate change thesis was victorious in influencing policy in Colorado because of its broader reach, although the other coalition "remains capable of engaging in political debates" (Elgin and Weible, 2013, p. 130).

In the Brazilian context, Macedo, Viana and Nascimento (2019), starting with data from the survey applied by the National School of Public Administration in 2017 (Enap, 2018), with the same profile of bureaucrats of the direct federal administration being explored by this research, make a substantial effort to investigate how analytical capacities are organized in the Brazilian federal administration. The authors observe that, depending on the commissioned position held, the area of policy and the government agency, as well as individual characteristics, such as the bureaucrat's level of education and how long he/she has worked in policy, the sources of evidence mobilized may vary.

As already mentioned, Filgueiras, Koga and Viana (2020), in turn, propose the study of policy capacities in association with the work performed by bureaucrats. Capacities are a latent concept that, although it expresses the accumulation of resources and structural conditions of state entities, does not allow us to observe state action per se or the result of its mobilization. On the other hand, the policy work portrays precisely that the diversity of state action and its performance would be conditioned to the accumulation of capacities. Therefore, they would be analytical keys that affect each other mutually and that when analyzed together, they would deepen the understanding of a greater plurality of contexts of mobilization of capacities and actions of bureaucrats in policies. The authors identify four different jobs performed by government managers – relational, analytical, managerial, and administrative – which vary depending on the field of policy.

Koga et al. (2020) identify four main types of sources of evidence used by the group of respondents by exploring data from the same survey analyzed in this research: i) internal – standards, technical notes, recommendations from control agencies, government databases etc.; ii) external non-academic – journalistic reports, recommendations from participatory forums, information from interest groups etc.; and iii) external academic – articles and scientific research; and experiential – personal experience and consultation with colleagues.
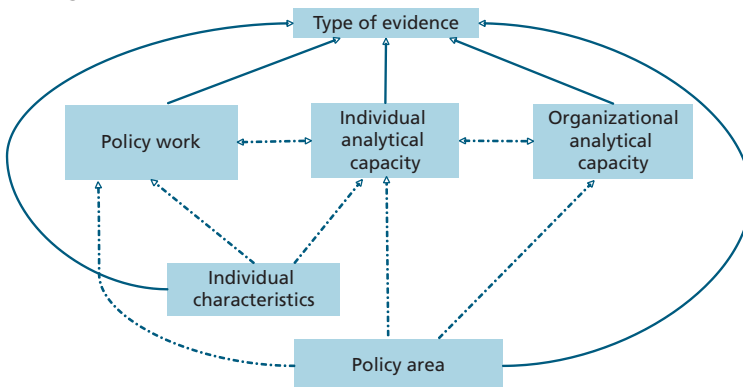
Based on new empirical evidence, this chapter intends to move forward in the debate about the conditioning factors of the pattern of use of sources of evidence by bureaucrats depending on the work performed and the analytical capabilities

present in the functioning of public administrations based on the Brazilian case. In this context, we aim to explore some hypotheses raised by the literature and other previous empirical works (Ouimet et al., 2009; Wellstead, Stedman and Howlett, 2011; Newman, Cherney and Head, 2017; Cherney et al., 2015; Macedo, Viana and Nascimento, 2019; Veselý, Ochrana and Nekola, 2018). To this end, in this study, we analyze the relationship between different types of information and contextual elements of the performance of federal bureaucrats in direct administration.

3 ANALYTICAL MODEL

Given the literature presented above, this section proposes the analytical model summarized in figure 1 to investigate the relationships of factors that constitute the context of federal bureaucrats' performance and the use of different sources of evidence. Four types of conditioning factors are identified in the model. The first one concerns *individual characteristics*, in general, analyzed by research with Brazilian federal bureaucrats (Cavalcante and Lotta, 2015; Saguin and Palotti, 2021; Macedo, Viana and Nascimento, 2019), which would incorporate sociodemographic aspects – such as age and gender – and professional aspects related to occupying management and advisory positions (DAS) and the place of work (in Brasilia or outside Brasilia). The second one deals with the areas of policy that, both in national and international literature, are explored as essential characterizers of differences in State performance (Davies, Nutley and Smith, 2000; Parkhurst, 2017; Macedo, Viana and Nascimento, 2019; Cavalcante and Lotta, 2022). Finally, the other two types of conditionals regard the factors of most interest in this paper, as justified earlier: analytical capabilities (individual and organizational) and types of policy work.

FIGURE 1
Path diagram

Authors' elaboration.

Considering the theoretical debate in section 2, figure 1 expresses the path diagram in which the arrows represent the direction of the hypothesized effect among the variables. In the proposed model, policy areas would affect analytical capacities and policy work and the use of the types of evidence sources. Organizational and individual analytical capacities would have a reflexive effect on each other and the uses of evidence types. At the personal level, individual characteristics would affect policy work and individual analytical capacity. The aspect *policy work*, in turn, would affect individual analytical capacity and the type of evidence used by the bureaucrat.

It is worth explaining that we will not analyze in this chapter the effects of all the relations suggested in the model, but only the association between these variables and the variable of interest – *type of evidence*. In other words, we will analyze the solid arrows' relationships, not the dashed ones. Finally, we state that the analysis proposed in this chapter is relevant insofar as it allows advances in constructing a complete explanatory model about bureaucrats' choice of information sources.

4 METHODOLOGY

The data analyzed here were collected in a survey as part of the research project *What does inform policy in Brazil: usage and non-usage of evidence by federal bureaucrats* by Diest/Ipea. The online questionnaire (self-administered) was sent by email to a sample selected from a universe of 96,543 civil servants in direct administration offices. The first sample contained 6,055 civil servants. Two more selection rounds were then carried out using exactly the same method, arriving at the final number of 18,165 public civil servants (Koga et al., 2020). Thus, 2,180 valid, complete records were obtained, representing a response rate of 12% of the sample.[9]

The questionnaire contains the variables referring to the dimensions presented in figure 1, that is, *type of evidence*, *policy work*, *area of policy*, *organizational analytical capacity*, *individual analytical capacity*, and *individual characteristics*, in addition to the variables: *how to occupy a DAS position*, *Unit of Federation (UF) where he/she is assigned*, *age*, and *gender* (all variables analyzed are listed in appendix A).

The hypotheses tested correspond to the effects of the variables concerning the use of certain types of information by federal civil servants, especially the variables *policy work*, *individual analytical capacity*, and *organizational analytical capacity*. To this end, we opted for structural equation modeling (SEM), a statistical technique of multivariate data analysis used to examine relationships between observable variables and latent variables (or constructs). This technique allows

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9. The full questionnaire can be found in Koga et al. (2020).

us to test theoretical propositions about how latent variables are formed[10,11] the relationships between them, as well as the direction of such relationships, in a cause-and-effect assumption.

In this sense, the analysis specifies and validates an SEM derived from theoretical approaches in the literature intending to investigate how types of policy work and other determinants related to the context in which bureaucrats perform (such as organizational and individual capacities) are associated with the uses of different types of information. In sum, SEM was used as a confirmatory technique for the proposed analytical model, mainly in understanding how and if the selected indicators are related to each type of information.

The R package lavaan, with diagonally weighted least squares estimation, was used in the analysis. The overall model fit measures indicate a good fit to the data. The Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR) were used to evaluate the model fit.

CFI indicated that the sample data are well fit to the model (0.92). Such an index measures the relative fit of the observed model when comparing it to the baseline model (i.e., the model with the worst fit), in which values above 0.90 indicate adequate fit (Hu and Bentler, 1999).

The RMSEA was 0.068, within limits indicated as a good model fit. RMSEA evaluates how far a hypothetical model is from a perfect model. According to Hooper, Coughlan and Mullen (2008), a value around 0.06 indicates a good fit, while the threshold value is 0.07 (Steiger, 2007).

In turn, the SRMR, which is the square root of the difference between the sample residuals of the covariance matrix and the hypothesized covariance model, was 0.059. The values of this index range from 0 to 1, with less than 0.08 indicating a good fit (Hu and Bentler, 1999). Thus, the three indexes (CFI, RMSEA, and SRMR) showed a good fitting of the model.

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10. Thus, the variables *type of evidence* and *policy work* are taken as latent variables (or constructs) that are indirectly observable through a set of indicators (as described in appendix A).

11. As described in Koga et al. (2020), the *type of evidence* variable was previously submitted to the factor analysis technique in order to detect common profiles in the answers obtained for the fifteen types of information presented to the respondents. At the occasion, it was possible to delineate four specific profiles: internal, external, academic, and experiential (see the distribution of the fifteen types among these four profiles in appendix A). On the same opportunity, the variable *policy work* was also subjected to the factor analysis technique (Koga et al., 2020). From the responses obtained for the fourteen types of work presented, it was also possible to delineate four specific profiles: analytical/control, relational, management/supervision, and administrative (see the distribution of the fourteen types among the profiles in appendix A).

5 RESULTS OF THE ANALYSIS

Table 1 presents a summary of the findings of the structural equation model.[12] With regard to the estimates, it is worth noting that the coefficients are standardized for the latent variables.[13] This means that they follow an approximately standard normal distribution (with mean 0 and variance equal to 1). As for the other (observable) variables, the results can be interpreted in their original scales (described in appendix A).

TABLE 1
Structural equation model results (2019)

		Type of evidence							
		Internal[1]		External[1]		Academic[1]		Experiential[1]	
		Estimate	Value z	Estimate	Value z	Estimate	Value z	Estimate	Value z
Policy work	Analytic/control[1]	0,818***	8,554	-0,056	-0,723	0,229**	3,135	0,345***	3,796
	Relational[1]	-0,820***	-9,260	0,727***	10,503	0,352***	5,891	-0,144	-1,842
	Contract/supervision[1]	0,478***	4,943	-0,160*	-2,224	-0,231**	-3,183	0,132	1,581
	Administrative	0,180***	12,614	0,097***	6,479	0,005	0,404	0,152***	8,900
Organizational analytical capacity	Resources	0,029	1,656	0,140***	7,761	0,184***	11,292	0,147***	7,063
	Specialized unit	-0,145**	-2,900	0,09	1,766	0,123**	2,655	-0,062	-1,070
Individual analytical capacity	Education	0,026	1,258	0,129***	5,976	0,348***	18,210	0,111***	4,686
	Skills	0,015	1,850	0,038***	4,583	0,050***	6,785	-0,007	-0,684
	Experience in policy	0,019	0,95	-0,025	-1,246	-0,009	-0,454	0,065**	2,834
Public policy area	Social	0,276***	3,734	0,038	0,513	-0,132	-1,960	-0,182*	-2,217
	Economic	0,308***	4,694	0,03	0,447	-0,075	-1,255	0,019	0,249
	Infrastructure	-0,061	-0,821	-0,076	-1,013	0,025	0,373	-0,11	-1,288
	Environment	0,142	1,258	0,408***	3,617	0,085	0,751	-0,032	-0,252
	Control	0,849***	8,245	0,283**	2,693	0,123	1,320	0,095	0,805
Individual characteristics	DAS 1-3	0,285***	3,903	0,005	0,065	-0,046	-0,697	0,185*	2,192
	DAS 4-6	0,393***	4,417	0,352***	3,816	0,091	0,973	0,269**	2,632
	Working in the Federal District (DF)	0,148**	3,015	0,213***	4,164	0,118**	2,620	-0,017	-0,292
	Age	-0,007**	-3,279	0,006**	2,738	-0,006**	-2,920	-0,007**	-2,935
	Gender	-0,046	-1,017	-0,102*	-2,213	0,03	0,717	-0,014	-0,278

Authors' elaboration.
Note: [1] Latent variable.
Obs.: * p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001.

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12. The correlations found between the latent variables (e.g., *policy work*) and their factor loadings are shown in appendix A. Although they are an essential part of the statistical model, from a theoretical and descriptive point of view, they do not add anything concerning the relationships analyzed here.

13. Regarding statistical significance, the asterisks beside the estimates describe the respective p-value (* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001). Thus, the presence of asterisks indicates statistical significance; likewise, the absence indicates no statistical significance. In turn, the magnitude of the relationship/influence between the variables should be observed by examining the value of the coefficient *estimate*.

As can be seen more clearly in table 2, the existing relationships between *policy work* and *type of evidence* are almost all statistically significant and have quite elucidative path coefficients (effect/influence).

One notices that the *analytical/control* work presents a positive and significant path coefficient in all types of evidence, except for the *external* type (-0.82). The others are: *internal* (+0.81), *experiential* (+0.34), and *academic* (+0.22). In other words, this type of work is related to a greater use of these three types of information.

Two main points are worth highlighting regarding these results. The first one concerns academic sources. Although the literature already recognizes that analytical work deals with gathering and mobilizing knowledge coming not only from scientific sources, we would expect that the most significant association with this type of source would be found in this type of work. Nevertheless, as shall be seen below, the most important association with the use of the scientific source was found in relational work.

The second point deals with the magnitude of the *internal* type of evidence (+0.81), at least twice as large as the *academic* and *experiential* types. This value indicates that the *analytical/control* function is strongly associated with a greater use of internal evidence, such as normative, technical notes, legal opinions etc. In fact, the very association of analytical work with control work, which was already pointed out in previous studies on bureaucrats, such as in the publications by Macedo, Viana and Nascimento (2019), Koga et al. (2020) and Saguin and Palotti (2021), raises questions about the form and purposes for which analytical work has been carried out in the Brazilian federal administration. That is, whether it is being done to support policy decisions, as advocated by the literature on policy analysis and EBP itself, or to respond to demands of control.

In any case, the significantly higher use of internal sources in the *analytical/control* work in relation to other sources is remarkable. Some hypotheses can be raised from these results. One of them would be the characterization of an eventual function of intermediation, validation, or translation of other sources of evidence, including the academic-scientific ones, performed by internal sources.

Another hypothesis would be the configuration of an endogenous process in which the federal administration itself would produce and consume its own sources of information. If we consider that recommendations from control and judicial decisions entities are among these internal sources, exploring this hypothesis becomes even more relevant, especially when possible, implications fit within the recent debate about the growing influence of management control (Filgueiras, 2018; Nogueira and Gaetani, 2018; Grin, 2020). Perhaps this is yet another front on which this influence can be analyzed.

TABLE 2
SEM results: policy work versus type of evidence (2019)

| | | Type of evidence | | | | | | | |
| | | Internal[1] | | External[1] | | Academic[1] | | Experiential[1] | |
		Estimate	Value z	Estimate	Value z	Estimate	Value z	Estimate	Value z
Policy work	Analytic/control[1]	0,818***	8,554	-0,056	-0,723	0,229**	3,135	0,345***	3,796
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Note: [1] Latent variable.
Obs.: * p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001.

On the other hand, the *relational* work presents a positive and significant path coefficient for the *external* (+0.72) and *academic* (+0.35) types of evidence. In this case, the magnitude for the *external* type indicates that the *relational* function is intensely associated with the use of knowledge produced by different groups in society (beneficiaries, interest groups, and media, among others), including the academic ones.

It is also worth noting that the *relational* function obtained the highest magnitude for the *academic* type of evidence (+0.35), so it stands out as the work most strongly associated with academic-scientific evidence, even though it is not the most prominent in that function. Meanwhile, the same function is negatively related to internal evidence use, which is significantly reduced with a magnitude of -0.82.

Although these results do not confirm the expectations of the greater use of scientific sources in *analytical/control* work, they corroborate the literature on policy work that highlights the effects of relational performance for the greater permeability of external interlocutors' influence (Meltsner, 1976; Colebatch, Hoppe and Noordegraaf, 2010). Moreover, as Ouimet et al. (2009) pointed out, the greater interaction with scholars would also lead to greater use of scientific evidence by bureaucrats, which may occur with more intensity in this type of relational work.

Regarding the *contract/supervision* work, the path coefficients were significant, with positive trends only for the *internal* type of evidence (+0.48) and negative for the *academic* (-0.23) and *external* (-0.16) ones. Again, this association seems consistent with what would be expected for a type of activity that, by definition, is aimed at ensuring compliance with internal norms and guidelines produced by the public administration itself.

Finally, *administrative* work – characterized by activities such as scheduling meetings, processing cases, preparing letters and memos etc. – presents significant

and positive path coefficients for the *internal* (+0.18), *experiential* (+0.15), and *external* (+0.09) types of evidence. In other words, this function is associated with using all three types of evidence. Contrarily, *administrative* work did not present significance for academic-scientific evidence, so there is no association between this role and the use of this type of evidence, as indeed was not expected given the more operational nature of this type of role.

Concerning analytical capabilities, by observing recommendations from the literature (Olejniczak, Raimondo and Kupiec, 2016; Wu, Ramesh and Howlett, 2015; Elgin and Weible, 2013; Pattyn and Brans, 2015), we sought to analyze both the effects of capacities accumulated at the individual level of bureaucrats and the impacts of capacities accumulated at the level of direct administration organizations, as presented in table 3. As for the individual level, analytical capacities were represented by the educational background, learned skills, and previous bureaucrats' experience, seeking to capture the analytical resources from formal knowledge and the analytical resources from tacit knowledge.

As argued in the specialized literature, prior knowledge and skills would determine the ability of individuals to recognize the value, acquire, evaluate, and use different sources of knowledge (Ouimet et al., 2009). As for organizational-level analytical capacities, these were represented by the level of informational resources made available by the bodies and the existence of a specialized structure that would configure a higher institutional maturity focused on the use of scientific evidence, as indicated by experiences in other countries (Newman, Cherney and Head, 2017).

TABLE 3
SEM results: organizational and individual analytical capacities versus type of evidence (2019)

		Type of evidence							
		Internal[1]		External[1]		Academic[1]		Experiential[1]	
		Estimate	Value *z*	Estimate	Value *z*	Estimate	Value *z*	Estimate	Value *z*
Organiza-tional analytical capacity	Resources	0,029	1,656	0,140***	7,761	0,184***	11,292	0,147***	7,063
	Specialized unit	-0,145**	-2,900	0,090	1,766	0,123**	2,655	-0,062	-1,070
Individual ana-lytical capacity	Education	0,026	1,258	0,129***	5,976	0,348***	18,210	0,111***	4,686
	Skills	0,015	1,850	0,038***	4,583	0,050***	6,785	-0,007	-0,684
	Experience in policy	0,019	0,95	-0,025	-1,246	-0,009	-0,454	0,065**	2,834

Authors' elaboration.
Note: [1] Latent variable.
Obs.: * *p*-value < 0,05; ** *p*-value < 0,01; *** *p*-value < 0,001.

According to table 3, the results regarding *individual analytical capacity* indicate a positive association between education level and the use of *external* (+0.13), *academic* (+0.35), and *experiential* (+0.11) types of evidence. The relevance of the

positive effect between education and use of academic-scientific evidence, as predicted by the literature (Ouimet et al., 2009; Wellstead, Stedman and Howlett, 2011; Newman, Cherney and Head, 2017), should be highlighted. As for the greater diversity of sources used by individuals with higher education, the results confirm the findings presented by Macedo, Viana and Nascimento (2019) for the same profile of bureaucrats surveyed in 2017.

On the other hand, the *skills* variable, which corresponded to the use of data processing tools and technologies, is only weakly associated with the greater use of *external* (+0.04) and *academic* (+0.05) evidence. In any case, since these are skills that would directly facilitate the use of this type of evidence, a positive association was expected.

Regarding the length of experience in policy, a significant relationship was found only for using experiential evidence, which was positive and weak (+0.06). Unlike what was raised by Macedo, Viana and Nascimento (2019) regarding the negative association between the time of experience and the use of various informational sources, the results of the 2019 survey do not allow us to identify an association between time of experience and other types of evidence analyzed in this research. Nonetheless, we believe exploring the implications of a possible disinterest in informational sources such as scientific and external as the bureaucrat specializes in policy remains valid. Would relying only on experiential sources reduce their analytical capacity and strengthen the tendency towards endogeny and self-absorption pointed out above?

From the point of view of *organizational analytical capacity* (table 4), it is essential to underline that the availability of organizational resources to obtain information from studies and research is positively associated with the use of *external* (+0.14), *academic* (+0.18), and *experiential* (+0.15) evidence. Furthermore, the existence of an organizational unit specialized in the use of research and scientific studies was positively associated with the use of *academic* evidence (+0.12) and negatively related to the use of *internal* evidence (-0.145).

These results corroborate both the EBP literature that discusses mechanisms and strategies for promoting bureaucrats' use of scientific evidence and the literature about capacities that problematize the relationship between individual and organizational analytical capacities. As for the former, the EBPs literature argues that the provision of resources, organizational incentives, and the creation of policy units can tell a lot about the level of rapprochement between bureaucracy and academia and the use of scientific evidence (Pattyn and Brans, 2015; Howlett, 2015; Cherney et al., 2015). In this same regard, such units aimed at mobilizing scientific knowledge could imply more significant use of scientific evidence and a lower demand for internal sources, as suggested by the data in table 3.

An important advance for understanding the effects of analytical capacities, particularly on the use of scientific evidence, would be to deepen the relationship between individual and organizational capacities, seeking to analyze how they affect each other. As the literature recognizes (Pattyn and Brans, 2015), in order for bureaucrats' analytical capacities to be mobilized, it is not enough to provide them with academic training. Organizations must also demand and provide institutional conditions for the use of scientific evidence and other informational sources. Understanding that dynamics and combinations of capacities favor a greater use proves to be a fruitful path for deepening this debate.

As for the results in table 4, it is worth mentioning that, from the perspective of SEM, not many relations with statistical significance were found between the *area of policy*[14] *and the type of evidence* used by bureaucrats. The *social* (+0.28), *economic* (+0.31), and *control* (+0.85) areas are associated with a greater use of internal evidence. The strong association in the case of the *control* area stands out. Such an area is also positively associated with the use of external evidence.

TABLE 4
SEM results: policy area versus type of evidence (2019)

		Type of evidence							
		Internal[1]		External[1]		Academic[1]		Experiential[1]	
		Estimate	Value *z*	Estimate	Value *z*	Estimate	Value *z*	Estimate	Value *z*
Public policy area	Social	0,276***	3,734	0,038	0,513	-0,132	-1,960	-0,182*	-2,217
	Economic	0,308***	4,694	0,03	0,447	-0,075	-1,255	0,019	0,249
	Infrastructure	-0,061	-0,821	-0,076	-1,013	0,025	0,373	-0,11	-1,288
	Environment	0,142	1,258	0,408***	3,617	0,085	0,751	-0,032	-0,252
	Control	0,849***	8,245	0,283**	2,693	0,123	1,320	0,095	0,805

Authors' elaboration.
Note: [1] Latent variable.
Obs.: * *p*-value < 0,05; ** *p*-value < 0,01; *** *p*-value < 0,001.

The hypotheses raised about the *analytical/control* work also deserve to be studied because of the results presented on the more specific performance of bureaucrats in the *control* area that rely heavily on *internal* evidence and, to some extent, *external* evidence. For example, as Oliveira and Menke (2020) point out in a study on the preferences of auditors at the Office of the Comptroller General (CGU), there is an apparent prevalence of the use of internal sources, such as standards and evaluations produced by the Comptroller itself. Notwithstanding

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14. In the analysis, the variable *policy area* was recoded as a dichotomous variable. Thus, for this variable, respondents linked to the central area were chosen as the reference group for the other areas. That is, the values indicate greater or lesser use by respondents from each area, always in comparison with respondents from the central area (for a list of the bodies that make up each area, see appendix A).

the existence of institutional guidelines to encourage the use of scientific evidence in audit processes, Oliveira and Menke (2020) report that CGU auditors are suspicious of this type of source, which is a finding that deserves to be analyzed.

Concerning the results concerning policy areas, it is also worth mentioning the important positive association of the *environment* area with the use of *external* evidence (+0.26). Such association has already been identified in the literature due to the specificities of the area in terms of subjection to international regulations, external financing evaluation standards, and interactions with non-governmental organizations and international organizations (Abers, 2016; Koga et al., 2020; Macedo, Viana and Nascimento, 2019).

Another important finding for this variable is that, from the model's point of view, there is no statistically significant association in the model tested between policy areas and the use of academic-scientific evidence. As suggested in the model in figure 1, it is possible that the effect of the use of evidence in policy areas is mediated by the type of work performed and the bureaucrats' accumulated capacities in the different policy sectors. Another previously mentioned hypothesis deals with the possibility that academic sources are indirectly consumed through other sources, such as standards, technical notes, and control recommendations, which absorb scholarly sources in their elaboration. In any case, this is an analysis to be deepened.

As for the bureaucrats' sociodemographic characteristics, the results presented in table 5 indicate a weak negative association between the male gender and the use of the *external* type of evidence (0.102, $p < 0.05$). A significant association was observed for all types of evidence for the variable age. However, with magnitude to be weighted depending on the age. It was negative for the *internal* (-0.007), *academic* (-0.006), and *experiential* (-0.007) types and positive only for the *external* type (+0.006).

TABLE 5
SEM results: individual characteristics versus type of evidence (2019)

		Type of evidence							
		Internal[1]		External[1]		Academic[1]		Experiential[1]	
		Estimate	Value z	Estimate	Value z	Estimate	Value z	Estimate	Value z
	DAS 1-3	0,285***	3,903	0,005	0,065	-0,046	-0,697	0,185*	2,192
	DAS 4-6	0,393***	4,417	0,352***	3,816	0,091	0,973	0,269**	2,632
Individual characteristics	Working in DF	0,148**	3,015	0,213***	4,164	0,118**	2,620	-0,017	-0,292
	Age	-0,007**	-3,279	0,006**	2,738	-0,006**	-2,920	-0,007**	-2,935
	Gender (male)	-0,046	-1,017	-0,102*	-2,213	0,03	0,717	-0,014	-0,278

Authors' elaboration.
Note: [1] Latent variable.
Obs.: * *p*-value < 0,05; ** *p*-value < 0,01; *** *p*-value < 0,001.

Relevant associations were identified about the functional characteristics related to occupation of positions and work in the DF. For the *internal* evidence type, positive associations were found both for the occupation of *DAS 1-3* (+0.28) and *DAS 4-6* (+0.39) and for *working in DF* (+0.15). This last variable also showed a positive association for the *external* (+0.21) and *academic* (+0.11) types of evidence, indicating a greater diversity in the use of evidence sources by federal bureaucrats working in the DF compared to those working in other Brazilian UFs.

This difference may be related to the different nature of the work performed and the degree of influence of bureaucrats working in organizational units of direct administration outside Brasilia, in general, more related to the operationalization of guidelines and decisions defined by the headquarters of agencies in Brasilia (Saguin and Palotti, 2021) and, therefore, with less demand and access to a diversity of informational sources. However, further studies deserve to be conducted to make statements about these dynamics. It should also be remembered that these data refer to the context of bureaucrats in the direct federal administration. This dynamic should be distinct if we consider the entities of the indirect administration, many of which are characterized by a high degree of specialization and located outside Brasilia, such as universities, regulatory agencies, foundations, and research institutes.

Finally, as for the DAS occupation, in addition to the positive association of higher magnitudes with the internal sources already mentioned, the results indicate an association with experiential sources for both *DAS 1-3* (+0.18) and *DAS 4-6* (+0.27). Furthermore, for these higher DAS, there is also a positive association with the use of *external* evidence (+0.35). These results, in dialogue with the literature on mid-level bureaucracy (BME), bring interesting questions to the debate.

As Pires (2018) reveals, bureaucrats who occupy a DAS act at an intermediate level between the so-called street-level bureaucracy and the decision-makers, both of which are pressured and external-environment oriented. In this role, the function of mid-level bureaucrats would be to act as "agents of integration, articulation, coordination, and production of coherence" within the State, influencing the production of policies by interfering in the flow of critical resources, including information resources (Pires, 2018, p. 201). Such a differentiated position and function of these bureaucrats raises the question of whether they exercise an intermediary function of the various sources of information, as already pointed out in the control bureaucracy case.

Furthermore, despite a greater diversification of sources, especially in the case of the higher DAS positions, the absence of association between the occupation of these positions and the use of scientific evidence again calls attention. For example, if mid-level bureaucrats are a relevant gateway to informational sources within the public administration, scientific evidence would not be accessed through them.

6 FINAL REMARKS

This chapter sought to present an x-ray of the types of evidence used by bureaucrats and which contextual factors of their performance in policy are associated with the consumption and use of these informational sources. Regarding Pinheiro's (2020b) proposal of the moderate model of evidence, this study is based on the understanding that an informational tool becomes evidence depending on the contextual framework in which it is used. Therefore, this would justify expanding the observation of the use of informative tools to a greater diversity of contexts in which users act.

In order to portray this greater diversity, an analytical model was proposed that considers four types of contextual conditioning factors of federal bureaucrats' performance, as well as the possible relationships between them, namely: policy work; the analytical capacities accumulated by bureaucrats and agencies; the policy areas in which they act; and the functional and sociodemographic characteristics of individuals.

In 2019, when data were collected via the survey, four types of informational resources were used by bureaucrats in the direct federal administration: i) internal – sources produced by the federal public administration itself; ii) external academic – academic-scientific research and sources; iii) external non-academic – research produced by other actors outside the federal public administration and non-academic; and iv) experiential – sources coming from the bureaucrat's own experience or co-workers.

Relevant associations were identified between these sources and the contextual factors analyzed. The strong association between the type of *internal* evidence and most of the contextual variables of the model should be emphasized, pointing to an accentuated use of this source, especially in the *analytical/control* and *contract/supervision* works, in DAS posts, and in the social, economic and control sectors.

Although some of these results are expected due to work, as in the case of the *contract/supervision* work, we argue that these results require further study on two main issues. The first concerns a possible role assumed by internal sources as intermediaries and validators of other sources of evidence, and the second is related to the relationship between analytical work and control. Are there gatekeepers or knowledge brokers who would control what other sources of information and how these would reach the federal administration? If so, how does this dynamic occur? Who would they be? The results presented in this research present control bureaucrats and DAS officials as actors who may be performing this function.

As for the external sources, the associations of greater magnitude were found in the more specific contexts of *relational* work, among the higher DAS officials (4 to 6), and the *environment* area. The first two factors may be related, as

suggested in the analytical model, and connect to a more interactive and business-like context in which the exchange of information sources is enhanced. The same would occur in the *environment* area due to the influence of the international setting and the more substantial presence of the policy's external stakeholders. However, the fact that other areas or types of policy work have not shown a positive association with this source of information may suggest a tendency towards self-enclosure or endogeny, which is already characterized by the significant presence of internal sources in the different contexts of bureaucratic performance.

The results concerning the sources of scientific evidence go in the same direction. At first, no positive association was found with any policy area. As for policy work, *relational* is again the one that would have some significant association due to its greater relationship with external actors and, therefore, access to a greater diversity of informational sources. In the second one is the *analytical/control*. The latter reinforces the argument for the need to deepen the context of this type of work and the relationship between control and policy producers also for access to scientific sources.

It is also essential to highlight the association between analytical skills, both individual and organizational, and the use of scientific evidence, as suggested by the specialized literature that argues that the use of this type of source demands not only qualification of bureaucrats but also research infrastructure and institutionalization of evidence governance tools.

Finally, as for experiential sources, positive associations were found in greater magnitude in *analytical/control* work and between DAS 4 and 6 officials. Research that examines the importance of tacit knowledge for specific work contexts in policy may help to understand these relationships.

We recognize that several developments and deepening can be envisioned from the results presented. One approach is to continue exploring and refining the proposed analytical model to advance explanatory analyses of the use of evidence. To this end, incorporating factors that allow investigating the relationships between the explanatory variables and the political-institutional dynamics of the actions of bureaucrats and organizations, as does the literature on policy subsystems in the advocacy coalition model, seems fruitful. The other approach is to conduct and compare studies with different profiles of bureaucrats, such as those of the internal administration, control bodies, and subnational entities.

In fact, other studies have already been or are being conducted in Brazil with this objective and deserve to be analyzed as a whole in order to add to a comprehensive picture of the Brazilian State's analytical capacity. Furthermore, the improvement of the methodology applied, through the use of experimental or qualitative methods that allow the triangulation of data, can also bring advances, especially in

the context currently experienced with the emergence of covid-19, which makes one question the importance, the uses and, limits of scientific evidence and what has actually been informing policies. This study aimed to be part of this path.

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APPENDIX A

VARIABLES, QUESTIONS, AND SCALES

TABLE A.1
Type of evidence and indicators (questions)

Latent variable	Question	Question in the questionnaire
Internal	D1	Laws and regulations.
	D2	Technical notes produced by federal public administration bodies.
	D3	Legal opinions and court decisions.
	D4	Recommendations from control bodies.
	D6	Government information systems and databases (for example, Siafi, Cadastro Único – Single Registry –, IBGE data etc.).
External	D5	Best practices and initiatives produced by states and municipalities.
	D9	Recommendations from participatory instances (e.g., policy councils, conferences etc.).
	D10	Experience and opinions of policy beneficiaries or ombudsman comments and suggestions.
	D11	Information generated by interest groups (e.g., unions, companies, social movements, NGOs etc.).
	D12	Opinions and recommendations of international organizations or best practices produced by governments of other countries.
	D13	News articles.
Academic	D7	Articles, chapters, or books produced by researchers.
	D8	Scientific research reports (e.g., research consulting products, Ipea discussion papers etc.).
Experiential	D14	Personal experience.
	D15	Consultation with co-workers from the same or other bodies of the federal administration.

Authors' elaboration.
Obs.: 1. Question in the questionnaire: "In the past 12 months, how often have you used the types of information listed below for your work?". Scale: never (1), rarely (2), occasionally (3), frequently (4), always (5).
   2. Siafi – Integrated System of Financial Administration of the Federal Government; IBGE – Brazilian Institute of Geography and Statistics; NGOs – non-governmental organizations.

TABLE A.2
Type of work and indicators (questions)

Latent variable	Question	Question in the questionnaire
Analytical/control	C1	Prepare reports, opinions, technical notes, and other information to support decision-making.
	C2	Collect and analyze data and information related to policy.
	C4	Elaborate normative texts (for example, bills, decrees, ordinances etc.).
	C10	Meet the demands of control bodies.
	C12	Advise directors.
Relational	C3	Hire and validate evaluation studies of the policy processes, results, and impacts.
	C6	Capture and negotiate financial resources to make policy actions, projects, and programs feasible.
	C8	Coordinate the team.
	C9	Represent your body, negotiate, and make agreements about actions and policies with other government entities (for example, other ministries, states, and municipalities etc.).
	C11	Consult with and assist interested groups in society on issues involving policy.
	C14	Organize events.
Contract/supervision	C5	Supervise compliance with policy rules and regulations.
	C7	Elaborate, negotiate, manage and supervise contracts, agreements, terms of development, terms of collaboration and other instruments.

Authors' elaboration.
Obs.: The question in the questionnaire is: "In the last 12 months, how often did you perform the following activities related to the policy in which you work?". Scale: never (1), rarely (2), occasionally (3), frequently (4), always (5).

TABLE A.3
Observable variables (questions)

Observable variables	Question	Question in the questionnaire
Administrative (type of work)	C13	Do you perform administrative activities, such as scheduling meetings, processing cases, purchasing tickets, and drafting letters and memos?
Area	A14	In which ministry or higher office do you currently work?
Resources	D49	Does my organization have enough means and resources to obtain information produced by scientific research and studies?
Institutionalization/ governance	D50	Within the structure of your ministry/body, is there an organizational unit (advisory, coordination, department, or secretariat) specialized in the use of scientific research and studies?
Formation	F4	What is the highest-level course you have completed?
Skills	E4	Do you use new tools and technologies for data processing and statistical analysis (programming in R, Stata, Python, Java etc.)?
Experience with policy	B2	How long have you been working with this policy?
Do you hold a management and advisory position (DAS)?	A5	What level of DAS or equivalent position do you currently hold?
Working in the Federal District	A16	In what state do you currently work?
Age	F2	How old are you?
Gender	F1	What is your gender?
Race/color/ethnicity	F3	What is your race/color/ethnicity?

Authors' elaboration.

TABLE A.4
Division into six major policy areas

Policy area	Body
Central	Special Advisory to the President of the Republic
Central	National Data Protection Authority
Central	Presidential Staff
Central	Personal Office of the President of the Republic
Central	Institutional Security Office of the Presidency of the Republic
Central	Ministry of Defense
Central	Ministry of Justice and Public Security
Central	Ministry of Foreign Affairs
Central	Government Secretariat of the Presidency of the Republic
Central	General Secretariat of the Presidency of the Republic
Central	Vice-Presidency of the Republic
Control	Federal Attorney General's Office
Control	Office of the Comptroller General
Economic	Ministry of Agriculture, Livestock, and Supply
Economic	Ministry of Economy
Economic	Ministry of Tourism
Infrastructure	Ministry of Science, Technology, Innovations, and Communications
Infrastructure	Ministry of Infrastructure
Infrastructure	Ministry of Mines and Energy
Infrastructure	Ministry of Regional Development
Environment	Ministry of Environment
Social	Ministry of Citizenship
Social	Ministry of Education
Social	Ministry of Women, Family and Human Rights
Social	Ministry of Health

Authors' elaboration.