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Federalism, Public Goods, and Collective Action Issues under COVID-19

Federalismo, bienes públicos y cuestiones de acción colectiva en el contexto de la Covid-19

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ABSTRACT

Taking national defense against COVID-19 as a pure public good, this paper aims to distinguish the risks of collaboration in producing collective action between federations in which central governments coordinated their provision and in which they did not. To do so, it mobilized a model of extensive games model between two local governments to analyze the risks of coordination, disagreement, and defection under both conditions. The resulting propositions were applied to a federation (Brazil) whose central government not only refused to coordinate in addition to trying to prevent subnational governments from reacting to the pandemic, supporting the argument that, in these cases, other federated entities not only dealt with coordination risks, increasing the risks of disagreement (on which measures to adopt) and defection (rushing into the relaxation of non-pharmacological measures). The study is relevant and original in that it offers micro-foundations for collective action problems in federations in which central governments have refused intergovernmental coordination to

RESUMEN

Tomando la defensa nacional contra el Covid-19 como un bien público puro, este artículo tiene como objetivo distinguir los riesgos de la colaboración que implica producir una acción colectiva entre federaciones en las que los gobiernos centrales coordinaron su provisión y en las que no lo hicieron. Para ello, movilizó un modelo de juegos extensivos entre dos gobiernos locales para analizar los riesgos de coordinación, desacuerdo y deserción en ambas condiciones Las proposiciones resultantes se aplicaron a una federación (Brasil) cuyo gobierno central se negó a coordinar, además de tratar de evitar que los gobiernos subnacionales reaccionaran ante la pandemia, aumentando los riesgos de desacuerdo (sobre qué medidas adoptar) y deserción (precipitación en la flexibilización medidas no farmacológicas). El estudio tiene relevancia y originalidad por ofrecer micro-fundamentos para problemas de acción colectiva en federaciones en las que los gobiernos centrales se han negado a la coordinación intergubernamental para el combate a la andemia, con el reto de contrastar sus argu-

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fight the pandemic, with the challenge of contrasting their arguments in comparative studies that go beyond the present effort based on secondary evidence on a single case.

Keywords: Federalism; Institutional Collective Action; collaboration risks; extensive games; COVID-19.

mentos en estudios comparativos que superen el presente esfuerzo quedando basados en evidencia secundaria sobre un solo caso.

Palabras clave: federalismo; Acción Colectiva Institucional; riesgos de colaboración; juegos extensivos; Covid-19.

Introduction

The COVID-19 pandemic offered a rare opportunity to compare the performance of national governments constituted under different political systems in the face of the same problem simultaneously. An interesting subset of these cases refers to federations, characterized by vertical political authority distribution in which different government levels act over the same territory and population. In some federations, mainly European ones, coordinated or centralized reactions aligned the choices of government entities at different levels; in others, the reactions of these entities were unilateral and fragmented, at times marked by the absence or even opposition of central governments to adopt non-pharmacological measures by subnational entities.

The national defense against the COVID-19 virus is understood herein as a pure public good since the provision of security in a subnational unit, whether states or municipalities, as in Brazil, is only possible when it is equally available to others. Conversely, the lack of pandemic control in one of them implies a potential risk to the other federated units. Defense against the same virus is understood here as a complex problem (Paquet & Schertzer, 2020), requiring coordinated action between multiple agencies, including non-state ones, and presenting overcoming collective action dilemmas as a requirement. In this work, however, in the expectation of analytical gains and considering federations constituted by multiple power centers (Elazar, 1987), we operate to reduce the problem of collective action to that involving the governments of federated entities in the fight against the pandemic and, particularly in the models proposed here, the governments of the municipalities, which in Brazil are the federated units to which the main health responsibilities fall. Moreover, in that sense, risks and uncertainties regarding the involvement of these governments or the results of their collective action can make unilateral actions more attractive. In these cases, the actions of central governments would be decisive in mitigating them and generating favorable expectations for overcoming these dilemmas.

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The evaluation of health policies against COVID-19, with their respective results regarding the number of infected people and deaths, also involves considering a huge number of variables in multiple dimensions, which defines the complexity of these policies and does not allow explanations based on simple causal relationships. However, we have to deal with the fact that several comparative studies involving the actions of federations pointed to different patterns of action and results obtained in controlling the pandemic. Federations such as Germany, Austria, and Switzerland presented coordinated or centralized responses (Hegele & Schnabel, 2021), which led to controlling virus dissemination after the first wave through non-pharmacological measures that were the only ones available before the vaccine distribution. Others, such as the North American, Mexican, and Brazilian measures, were predominantly guided by unilateral responses, fragmented and uncoordinated by the central government (Bennouna et al., 2021), without the contagion curve returning to previous levels before beginning the next wave. Nevertheless, although coordination by the central government is perceived as a decisive factor in promoting collective action in federations by providing information and action guidelines for all federated entities, it is not clear how its omission, or possibly its opposition, affects the risks and costs involved in horizontal cooperation initiatives between subnational governments. If, on the one hand, it is true that "the short-term reduction in the role of the Union has increased intergovernmental lack of coordination" (Abrucio, Filippim & Dieguez, 2020: 672), the generality level of this finding clarifies little about the differential in the configuration of action problems collective between the federations in which the central governments took over and those in which they did not assume the conduct of national defense against the pandemic.

To move in this direction, we adopted the conceptual distinction between coordination, disagreement, and desertion risks for the emergence of intergovernmental cooperation based on the Institutional Collective Action approach to propose an extensive game model between local governments under two contexts: with and without central government leadership. In addition, we extended our partial conclusions to a macro-social analysis, submitting them to a concrete case of lack of conduct: Brazil. The central government in Brazil not only denied the seriousness of the pandemic and refrained from coordinating the national effort to fight it but also systematically boycotted actions by subnational governments in this regard.

Our central argument is that, unlike the federations whose reaction to COVID-19 was conducted by the central government and which dealt with coordination risks between government entities, not only did the disagreement risks increased in those where such a government was absent but also the risks of desertion in maintaining restrictive measures since subnational entities are more vulnerable to internal pressures from economic or political groups in favor of their flexibility.

The mobilization of representative models for collective action dilemmas at the micro-social level, as proposed in this work, has an outstanding heuristic value for offering working

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hypotheses in empirical works on intergovernmental cooperation (Scharpf, 1997; Feiock & Sholz, 2010; Feiock, 2013), as well as contributing to formulating theoretical propositions consistent with findings of already completed work. On the other hand, it is true that extending models of this type to the macro-social level simultaneously introduces several contextual variables requiring parsimony and care. In general, Institutional Collective Action has considered the specific risks of collaboration for contexts well-profiled in time and space, but the analysis of collective action problems before COVID-19 simultaneously involves several spatial contexts. In some cases, neighboring local governments may include allies of denial presidents who disagree with the intensity or temporal extent of the restrictive measures. In other cases, even if all neighboring governments are allies in the fight against COVID-19, they may be exposed to internal economic or political pressures against the restrictive measures, being attracted to adopt flexible measures or non-compliance with the signed agreements. The extension of conclusions from abstract and simplified models to broader complex social universes thus depends on considering these variables.

This article is organized into four sections besides this introduction and the conclusion. In the next section, considering federalism as a distribution form of authority aimed at overcoming collective action problems in providing national public goods, we take the defense against COVID-19 as a pure public good and identify different performance patterns of federations in the provision. In the following section, we present the Institutional Collective Action approach, distinguishing different collaboration risks that affect the provision of public goods. In the third section, we present assumptions and attributes of the extensive game models proposed in this work to distinguish collaboration risks between local governments in scenarios with and without the presence of central government leadership. In the fourth and last section, we submit our arguments to analyze the Brazilian case: a federation in which (like the Mexican or United States federations in the Trump era) the central government not only refused to coordinate non-pharmacological measures but also acted ostensibly to boycott them. In this case, the analysis suggests the convergence between findings in the literature on the pandemic in Brazil and the proposals emerging from the model presented regarding the simultaneous increase in the risks of divergence and desertion between subnational governments, in addition to the coordination risks also generally present in federations.

Federalism, provision of public goods, and COVID-19

Modern federalism, born at the Philadelphia Convention at the end of the 18th century, introduced a new institutional formula to overcome collective action problems that eroded the confederative forms that historically preceded it. Difficulties in distributing external de-

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fense costs or war debts among the former colonies, or the temptation to exploit commercial advantages for some of them to the detriment of the whole (Riker, 1964), undermined its cohesion and jeopardized collective survival. The federative formula introduced a central government with the authority to formulate and enforce laws of collective interests, providing public goods whose scope came to be defined in Article 1, section 8: authorization for taxation, regulation of interstate commerce, and external defense (Siegel, 2012).

Thus, delimiting central government responsibilities was originally guided by the need to overcome collective action problems in providing national public goods (Buchanan, 1999; Oates, 1999; Inman & Rubinfeld, 1999), with cooperation between constituent entities in a decentralized system spontaneously emerging not being expected (Bednar, 2008). It was a question of determining which government level would be the most adequate to exercise certain functions, balancing the costs and benefits of its centralization or decentralization (Inman & Rubinfeld, 1999). However, this adjustment should consider a series of factors: allocative efficiency (capacity to maximize the social well-being of constituents), technical efficiency in the production of services, capacity to absorb negative externalities between constituent units, or even the need to promote the redistribution of resources.

With responsibilities distributed between government levels, Bednar (2008) noted that responsiveness to constituents typically makes those who govern constituent federated entities actors likely to adopt policies that bring them allocative advantages, even when harmful to the federation as a whole. Institutional safeguards could be built to prevent opportunistic behavior by members of the federation, but specifying which public goods should be under the Union's responsibility and, therefore, under its legislative jurisdiction did not prove to be trivial. There are no universally acceptable neutral or technical formulas considering their inevitable distributive effects regarding the allocation of political power between government levels. At this point, Siegel (2012) considered that a more restricted or expanded concept of the state (whether a minimal state or a social state, for example) would affect the delimitation of the central government's role by linking a more restricted or expanded perspective of this nature to problems that would demand their action.

Thus, the level of tolerance to decision-making diversity in a federation is based on a concept of the state's role (Obinger, Leibfried & Castles, 2005; Arretche, 2012), making it acceptable, for example, that constituent units develop their own policies to guarantee civil or social rights. However, at this point, the impact of the COVID-19 pandemic asked federations about the convenience of local variation in decision-making processes and the risks of betting on its decision-making innovation potential (Knauer, 2020). The high potential for negative externalities arising from divergent choices between the constituent entities in combating the virus could put the federation as a whole at risk, as when one of the jurisdictions gives in to pressures for the flexibility of non-pharmacological measures and puts the achievements made by the country as a whole under the sacrifice of its adoption.

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Starting from Olson's (1968: 14) definition, a public good is anything in which "if any person Xi in a group Xv ... J Xi' ..., X" consumes it, it cannot feasibly be withheld from the others in that group." The defense against COVID-19 is presented here as a national public good since its provision to a federated unit —be it states or even municipalities, as in the Brazilian case— would necessarily imply its provision to others. However, there would still be two impactful attributes for allocating responsibilities between government levels in a federation. First, the emergency nature of the defense against COVID-19, requiring immediate action under penalty of imposing substantial damages in terms of life and economic destruction. Second, there is a need for action "by many hands," given that no single institution would be able to respond satisfactorily (Knauer, 2020). Thus, it would be an action that would not only require a quick solution but, unlike other public goods of a national character, unilateral or coercive action imposed by the Union would not be enough.

Compared to unitary countries, there is no evidence that federations have been less effective in defending against COVID-19, but there already appears to be plenty that they did not react uniformly on (Hegele & Schnabel, 2021). Its performance depended on variations in the powers and capabilities invested in the central government, as well as, surprisingly, on the willingness of this government level to take over coordination efforts. Management by the central government was decisive for a favorable outcome of the virus containment policies in European federations such as Switzerland, Germany, and Austria (Hegele & Schnabel, 2021), as well as for an unfavorable outcome in the cases of Brazil, United States, and Mexico (Bennouna et al., 2021).

Switzerland is the most decentralized among the three European federations; Germany would be more centralized than the latter, and Austria would be comparatively overcentralized (Hegele & Schnabel, 2021). However, despite the variations in the performance of the three countries, the national defense against the virus found the central government to be the protagonist in articulating national defense against COVID-19 through centralization (Switzerland) or decentralized or centralized coordination (in Germany and Austria, respectively). There was a confrontation between the central and provincial/state governments at federations governed by populist and denial presidents, like in Brazil and the United States, with unilateral and fragmented reactions from government entities (Bennouna et al., 2021). These reactions varied between the two countries, but the formation of horizontal cooperation patterns between subnational governments under party patterns was more evident in the North American federation, although the "neighborhood effect" was also noticed in the Brazilian case. However, in other federations on the American continent, namely Canada and Argentina, central governments took an active role in the defense against COVID-19, despite the low institutionalization of cooperation mechanisms, especially in the first case (Paquet & Schertzer, 2020).

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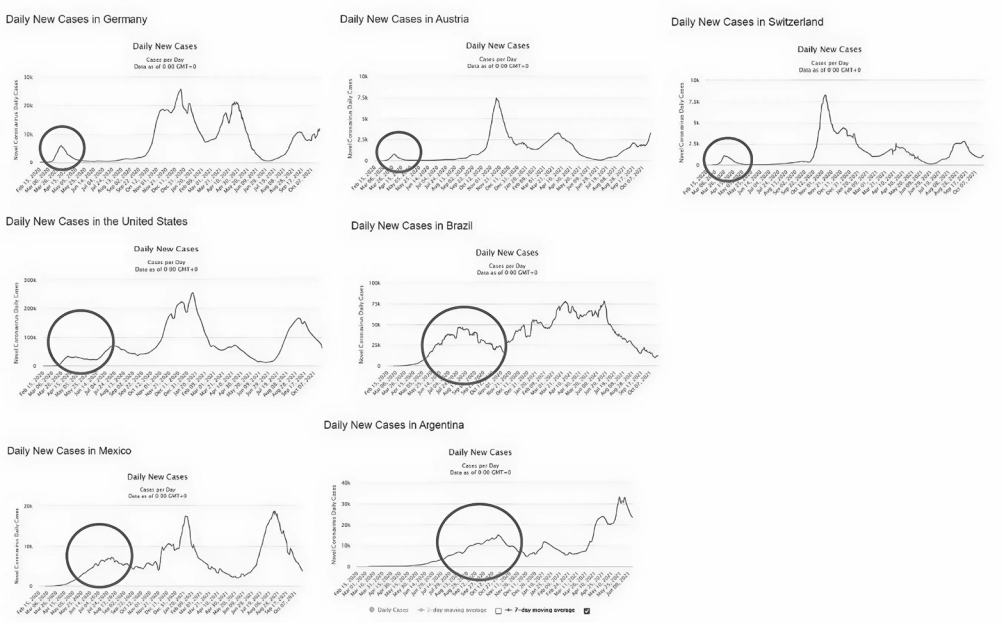
The dissemination curves of new cases (as shown in Figure 1) under the averages of the last seven days during the first wave of the pandemic offer an interesting illustration given that, at the time, only restrictive and physical isolation measures were available as a containment measure by governments. At this restricted moment, the three European federations could return the contagion curve to the initial pandemic levels, unlike the American federations.

Figure 1
New cases of infection in the first wave of COVID-19 in different countries



Source: Worldometer (s.f.).

Although the distinct characteristics of the contagion curves cannot be attributed solely to the coordinated or more centralized character of the European federative response, recognizing the aforementioned causal complexity in its production, there is a reasonable convergence of comparative studies regarding the importance of the type of governmental response in federations. The case of the United States and the three largest Latin American federations also points in this direction.

In the United States, not only was there a lack of a national organization, but given President Trump's threats to governors, the adoption of restrictive measures by states was supported by the Tenth Amendment in the United States (Knauer, 2020), but it was not general or coordinated, which on an aggregate level, it meant keeping contagion levels high

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since, while it fell in some cases, it rose in others. In the largest Latin American federations, despite constitutional and legal provisions for coordinated action, the Brazilian case has similarities with the American one, with the Federal Supreme Court (STF) guaranteeing the prerogative of states and municipalities to adopt or not the necessary measures in the face of negative action and attacks on non-pharmacological measures by President Bolsonaro (Calil, 2021; Cepedisa, 2021). In Mexico, under a vertical and dual federative structure, the absence of negotiation channels at the legislative level or between executive powers can largely explain the friction and disorganization in response to the pandemic (Rojas, 2021; Cabanas-Veiga, 2022), for example opposing the guidelines from the President to the Coordinación Noreste COVID-19 (provinces of Coahuila, Nuevo León and Tamaulipas). In Brazil and Mexico, however, there were horizontal cooperation initiatives involving regional or local governments (Bennouna et al., 2021), ranging from purchasing masks or respirators to coordinating non-pharmacological measures. In Argentina, in the absence of constitutional provision for coordinated emergency action, the previous trajectory of agreement between the national executive and provincial authorities led to a more coordinated and cooperative response, despite tensions and unilateral measures taken by some provinces in the process of easing restrictive measures (Leal & Santamarina, 2021) and, coincidence or not, its contagion curve after the first wave came closer to a return than in the cases of Brazil and Mexico.

When mentioning horizontal cooperation in the previous paragraph to acquire inputs in the face of the pandemic, it is important to distinguish the nature of the public goods involved. The associated acquisition of goods or services shared between different territorial jurisdictions, such as masks or respirators, does not refer to pure public goods: they can be consumed at an individual level and be available to groups of individuals or certain jurisdictions without necessarily being available to everyone. In these cases, the benefits of cooperation between subnational governments would result from economies of scale or density. This distinction concerning pure public goods (Olson, 1968), involved in adopting non-pharmacological measures, is relevant because it concerns distinct collective action problems.

Impure public goods or for private consumption can be provided by voluntary associations, as in the case of cooperation between states or municipalities for the purchase of alcohol gel, masks, or respirators. In these cases, collaboration risks could be summarized as desertion risks, the mitigation of which is relatively simple: the association's contractual clauses generally condition access to the benefit to prior participation in the costs. Nevertheless, pure public goods, such as security against the spread of the virus in a community by adopting non-pharmacological measures, would imply universal benefit and, in the case of COVID-19, the requirement that costs are necessarily assumed in a general way: if all do not cooperate, no jurisdiction will be safe. It is possible, therefore, that in the pandemic con-

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text, subnational governments may cooperate in producing impure public goods while not cooperating in producing a pure public good.

Another difference regarding the nature of the public goods involved in the case of COVID-19 refers to the directionality of the pressures suffered by managers in the intragovernmental arena: they tend to be positive in favor of cooperation in the case of acquiring inputs for prevention or care for those affected by the virus, but they can be negative and with strong preference intensity in the case of imposing non-pharmacological measures, at least by the directly affected economic and social segments (Moraes, 2021). This is relevant given that voluntary cooperation between subnational governments could be more attractive in the first case than in the second, with the coordinated implementation of non-pharmacological measures being significantly more complex than the associated acquisition of inputs and services. In non-pharmacological measures, the presence of the central government would be essential to set parameters for action, provide information, lower implementation costs by state or local governments, and properly monitor and sanction eventual deserters. The evolution of the contamination curves described in Figure 1 converges with this idea. However, this finding does not help to clarify how the absence of central conduction or, more than that, as an action contrary to the adoption of non-pharmacological measures by the government would affect the calculation of subnational governments and worsen collective action problems.

Macroscopic explanations tend to neglect causal mechanisms operating in interactions between subnational governments (Greer et al., 2020), clarifying little about the configuration of institutional incentives and how the combination with contextual elements affects their choices at the microsocial level, something necessary to think about for alternatives for overcoming obstacles to intergovernmental coordination in providing public goods, such as in the defense against the COVID-19 pandemic (Paquet & Schertzer, 2020). Considering this point, the objective of this work is based on the Institutional Collective Action framework to offer a distinction for the collaboration risks between subnational governments involved in adopting non-pharmacological measures to combat the pandemic under two conditions: with and without the coordination of the central government. In the next section, we present categories and arguments of the Institutional Collective Action that will be mobilized herein.

Institutional Collective Action and collaboration risks

Institutional Collective Action essentially deals with applying the central argument developed by Olson (1968) in treating collective action problems in providing pure public goods in large groups whose members have a common interest in their provision. Institutional

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Collective Action focuses on fragmented government agents who could be better off acting collectively rather than unilaterally when faced with a common problem (Feiock & Sholz, 2010). However, unlike the Olsonian context, it broadens the nature of collective action problems by including new modalities of barriers to their realization other than the temptation to desertion via free rider behavior.

As for its applicability, the governmental structure fragmentation has expanded in two directions in the face of a State whose tasks have been progressively expanded: in a vertical dimension through decentralizing responsibilities and financial resources to subnational governments, horizontally by multiplying agencies and controls at the same government level. Under this fragmentation, collaborative mechanisms were mobilized to deal with resulting inefficiencies or limitations: economies of scale gains, regulation on the use of common resources, absorption of negative externalities or distribution of the costs of any positive externalities which, although generated by the choices of agents, can benefit others.

Most studies of this approach have focused on identifying the conditions that affect cooperation between local governments in federations or countries with decentralized political structures. Among these conditions, some have been frequently mentioned: how homogeneous or heterogeneous are local governments (Gerber & Gibson, 2005; Feiock, 2007; Kwon, 2007; Tavares & Feiock, 2018); whether shared goods or services can be measurable or not, which could make it difficult to divide costs and benefits (Feiock 2007; Kwon, 2007; Tavares & Feiock, 2018); whether decision rules adopted by the association may or may not increase costs to reach an agreement (Gerber & Gibson, 2005, 2009), among others.

In this approach, collaboration risks constitute a central category to understand how the obstacles to the self-organization of local governments to solve collective problems are structured. Kim et al. (2020) think that they vary according to the combination of three exogenous elements: the nature of the problem, actors' preferences, and existing institutions. The nature of the problem refers to the attributes of the good or service in question, for example, whether they are divisible between beneficiaries and whether they can be denied to non-contributors. Preferences refer to the relevant actors involved in decisions about the scope of cooperation or possible schemes for distributing the benefits of collective action. On the other hand, existing institutions include structures or rules under which actors previously interact and under which institutional powers and resources assigned to them are defined.

In turn, Feiock (2013) offered a typology that linked collaboration risks to variations in collective action problems, reaching three categories: *1*) coordination risks, *2*) division or disagreement, and *3*) desertion.

Coordination risks arise when something prevents individuals from acting together or adopting a common response pattern in those cases where "the interconnectedness of activities and policies is critical for success" (Feiock, 2013: 406). They are typically represented by the Stag Hunt game, whereby two hunters have to choose between adopting a

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strategy to hunt the moose (which requires collective coordination and has superior benefits) or to hunt hares (which may be one-sided but has inferior benefits) so that the lack of synchrony between both choices could lead to a suboptimal balance (Holzinger, 2003). The gains unilaterally obtained in the latter case would be smaller than those obtained under the cooperation between them, but this would depend on the reciprocal sharing of information about the partner's behavior, and the efforts of one of them would be innocuous if the other did not do the same.

On the other hand, division or disagreement risks arise in cases where, even with mutual gains from joint action, local governments deal with obstacles to sharing the costs or benefits among themselves (Feiock, 2013). There are multiple possible balances, with different reward distributions between them, as usually occurs in the battle of the sexes. In this, the interacting agents have preferences that vary in two dimensions, converging in one of them (being alone or being together) and conflicting in the other (going to the opera or fighting). The possible combinations of crossing these two dimensions generate two possible equilibrium outcomes, neither of which simultaneously serves the two players, who each prefer to be together but doing their "favorite program" (Holzinger, 2003). This game represents disagreement between those involved in collective action regarding the best preferred outcome in the future.

Finally, the risk of desertion emerges as the participant in an agreement perceives unilateral decisions that result in a worse condition for the other person or others as attractive, as in the game "Prisoner's Dilemma." This last game is notable for the conditions offered by a police officer to two likely burglars who choose between confessing or not to the crime, given that confessing or betraying their partner would bring a better result to any choice made by the partner. Thus, unlike coordination problems, the cooperation gains in this game would be inferior to the individual gains obtained with desertion while the others cooperate. The temptation to defect could only be mitigated by coercive mechanisms or selective incentives, with the latter being able to remunerate the individual who cooperates in parallel.

Figure 2 below represents the games involved in the cases of different collaboration risks, highlighting the respective balances. There is a single suboptimal balance in the Prisoner's Dilemma as defection becomes the dominant strategy for both players, but its combined adoption would lead to a worse outcome than cooperation (both confess). There are two balances in the Stag Hunt: a suboptimal one, in which each opts for a unilateral strategy (hare hunting), and an optimal one, in which both cooperate (moose hunting) and the challenge to transition from one equilibrium to the other would be for both to change their strategies simultaneously. Lastly, there are two balances with symmetrically opposite distributive effects for players in the battle of the sexes, who have conflicting preferences about which balance to choose.

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Figure 2
Games involved in the collaboration risks and respective balances

Prisoner's Dilemma (Desertion Risks)

Prisoner 1 \ Prisoner 2	Not confess	Confess
Not confess	-1, -1	-9, 0
Confess	0, -9	-6, -6

Stag Hunt (Coordenation Risks)

Hunter 1 \ Hunter 2	Moose	Hare
Moose	2. 2	0. 1
Hare	1. 0	1. 1

Battle of the Sexes (Disagreement Risks)

Chris \ Pat	Opera	Fight
Opera	2. 1	0. 0
Fight	0. 0	1. 2

Source: adaptation from Gibbons (1992).

Different collaboration risks could dominate different interaction contexts between different state agencies, and at this point, we can return to the distinction between public goods referred to in the previous section. Although they refer to intergovernmental cooperation before COVID-19, it is understood here that the shared acquisition of inputs and coordination of non-pharmacological measures do not concern the same collaboration risks. In the case of shared acquisition, as typically occurs in commercial relationships, the risks of breach of contract (or betrayal) typically refer to the temptation of desertion by one of the parties when, for example, one of the local governments does not make its contribution to the apportionment of costs for shared production of services by the association. Following the same example, the agencies involved may have conflicting preferences about the acceptable costs of joint production (risks of divergence), but this does not seem to be such a frequent obstacle in partnerships of this type.

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However, in the case of adopting restrictions foreseen in non-pharmacological measures against COVID-19, the identification of collaboration risks does not seem clear. The lack or inconsistency between information on the intensity or targeting of restrictive measures increases the coordination risks. It may cause some governments not to take necessary actions and jeopardize the collective results of combating the pandemic, but this risk could be mitigated by adopting technical parameters proposed by a central government or international organization. On the other hand, even given widely recognized parameters, it is possible that for political-ideological reasons, for example, governments could have conflicting preferences on the intensity or direction of restrictive measures, which would increase the disagreement risks and could make a cooperation agreement. In addition, certain local governments, also for political-ideological reasons or pressure from economic sectors that lose from adopting non-pharmacological measures, could be tempted to relax restrictive measures before there was security for this (desertion risks).

In the next section, we propose a simple model to stipulate how the absence or presence of central government coordination could impact the different collaboration risks.

Interaction between local governments with and without central coordination

To simplify the extensive form of the collective action game against COVID-19, it was decided not to distinguish between different levels of subnational governments and to adopt the design of a federation composed of a single level below the national government, herein generically designated "local government." The conditions of that game are presented below.

Condition 1: Choice of local governments between "restriction" or "flexibility"
The restriction actions inherent to non-pharmacological measures against COVID-19 may vary in intensity and duration in the real world or even present different intermittence rhythms alternating between restriction and relaxation. However, for simplification, Condition 1 assumed that local governments have two alternatives in the time frame considered: adopting "restriction" or "flexibility" given the risks of spreading the virus.

Condition 2: Interdependence between choices of local governments under strong pendular movements between local governments
Decisions by "restriction" or "flexibility" have effects extending beyond the jurisdiction of each local government. This is due to the incubation and transmission pattern of the virus, mainly through interactions between humans (Fauci et al., 2020; Weitz et al., 2020), even

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before the onset of symptoms and without the need for physical contact. Thus, people who live in one municipality but work or carry out economic transactions in another can be carriers and spreaders of the virus, even if they do not realize it. The more intense the commuting movements between local governments, the more likely the virus is to cross borders.

Condition 3: Only coordinated restriction between local governments stops the virus spreading

Because of Condition 2, it is impossible to prevent the virus from spreading in the isolated sphere of jurisdiction, depending on the restrictive actions to be taken simultaneously by local governments. Suppose a locality maintains its economic and social activities and operates normally without restrictions. In that case, citizens of other localities who work there or carry out commercial transactions in person will have contact with the virus and will spread it in their circle of contacts in their locality. Thus, reducing cases and deaths due to COVID-19 depends on the coordination between the restriction measures by the neighboring local governments.

Condition 4: Internal resistance to local restrictive measures is inversely proportional to the virus spread movement

Adopting restrictive measures produces diffuse benefits but concentrated effects in certain economic and social segments, whose activities depend on face-to-face interactions and have the resources to impose electoral damages on local managers (Caponi, 2021; Ipea, 2021). However, such electoral damages would tend to be smaller with the increase in cases and deaths, constituting an environment that tends to justify adopting restrictive measures. Nevertheless, in the opposite contexts where the virus spreads and the number of deaths decreases, local governments would find increasing resistance to adopt restrictive measures.

First, we will analyze the evolution of the reciprocal effects between the restriction or flexibilization strategies adopted by two local governments without a central government, which we will call "M1" and "M2". M1 and M2 can present themselves in different situations over time: decrease in cases (white), moderate increase in cases (gray), and accelerated increase in cases (black). The "restriction" and "flexibilization" strategies may vary throughout each node of the extensive form of play. Figure 3 shows different situations:

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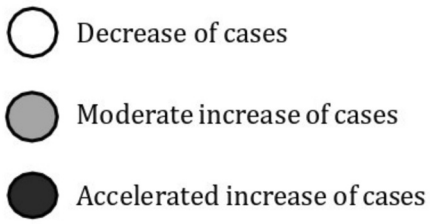
Figure 3
Situations of municipalities during the pandemic



Source: Figure by the author.

Thus, considering only the first three conditions (the fourth will be included later), the relationship between strategies and results is such that:

1) Choosing "flexibilization" under a moderate increase in cases (gray), one local government will be on an accelerated increase (black) in the next moment, no matter what the other does;

2) Choosing "restriction" under a moderate increase (gray), one local government can have two possible outcomes when the other is also moderately increased (gray): *a)* if the other chooses restriction, both will be decreased (white) in the next round; *b)* if the other opts for flexibilization, both will be in accelerated increase (black) in the next round;

3) If one of the local governments is in an accelerated increase (black), the other will be in the same condition in the next round, no matter what its status was at the time before (remember that there is a strong pendulum movement between them).

Considering these parameters, we can observe two scenarios in which at least one of the municipalities is in a moderate increase (gray): *a)* in Figure 4, where M1 is in moderate increase (gray) and M2 is in decrease (white); *b)* in Figure 5, where both are in moderate increase (gray).

Considering the results of Figures 4 and 5, it is concluded that *1*) the only combination of strategies that leads to a decrease in cases (white) for both is "restriction"/"restriction," regardless of whether only one or both were in moderate increase (gray) at the beginning; *2*) the "restriction" strategy is not enough to lead to a decrease (white) if the other chooses to flexibilization; *3*) given the strong spreading power of the virus and the high intensity of pendulum movements between M1 and M2, the accelerated increase (black) in any one municipality can cancel the "restriction" adoption effect by the other in the next round.

In the name of parsimony, we do not consider other contextual variables that could affect the results described in the real world: variations in distances, population asymmetry between M1 and M2, or even other attributes that could produce different times or loss of

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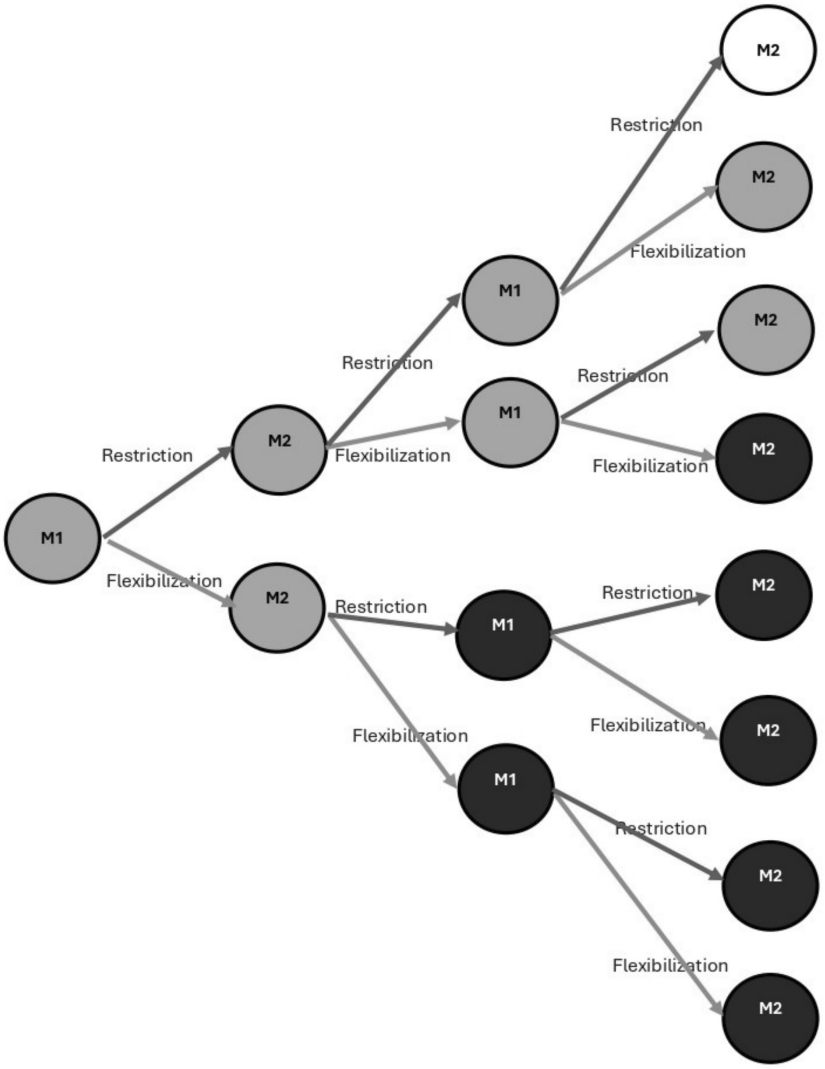
synchrony between responses. What matters in an extensive game model, such as the one presented here, would be testing the logical connections between conditions and results under the mediation of the strategies sequentially chosen by the actors in the interaction process.

Figure 4
Choose between restriction and flexibilization when M1 is growing moderately (gray) and M2 is decreasing (white)



Source: Figure by the author.

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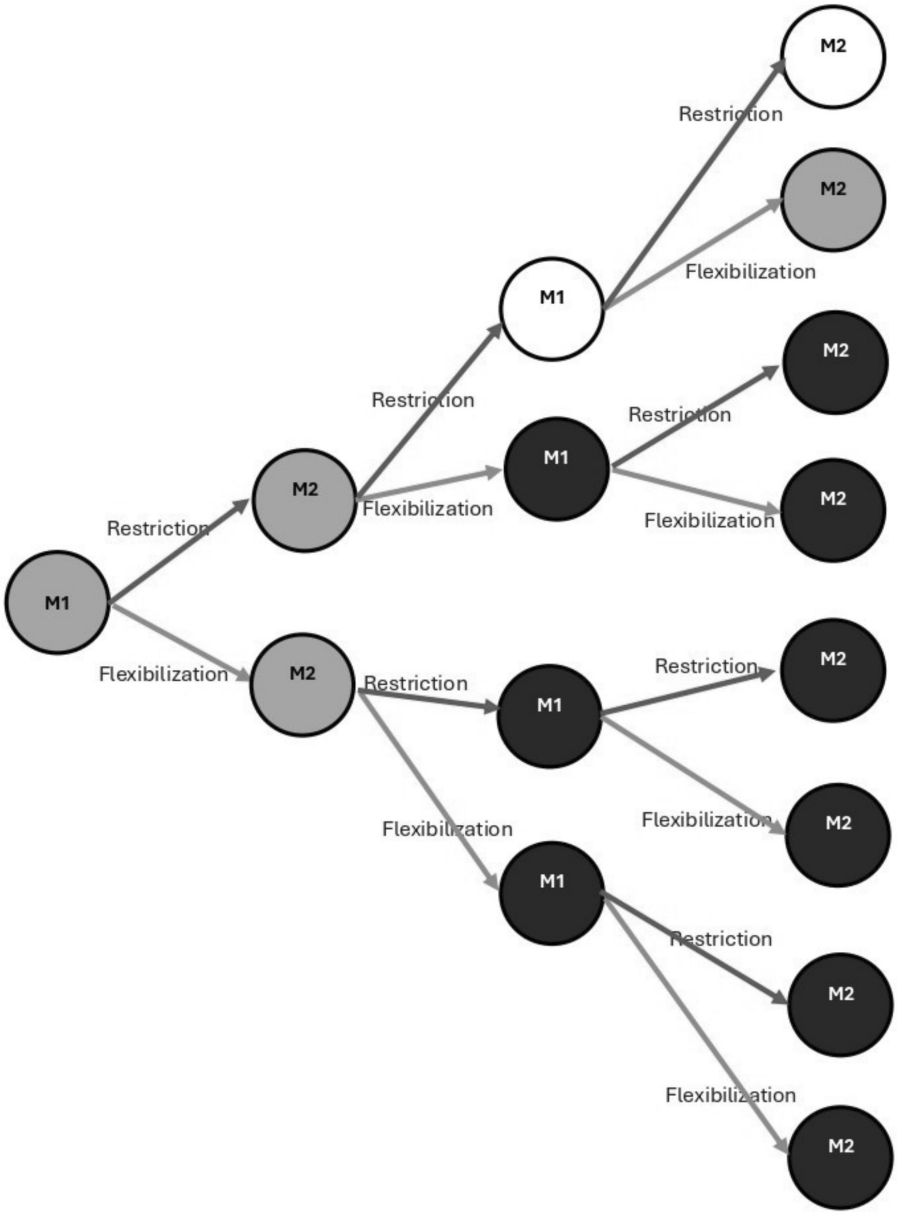
Figure 5
Choose between restriction and flexibilization when M1 and M2 are in moderate growth (gray)



Source: Figure by the author.

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In this sense, blocking the virus spread depends on the coordinated choice of restrictive measures and, with no disagreement between M1 and M2 regarding the adoption of these ("restriction"/"restriction"), including the technical parameters to be adopted and the distribution of costs, and also regarding the intended result (decrease of cases), the collaboration risks would only be those of *coordination*. *The presence of a central government* nationally establishing the restriction parameters (restricting chances of disagreement) and triggering local governments on the opportunity for their adoption (monitoring and sharing information with them) could mitigate coordination risks between them and thus contribute to the decrease of the contagion curve.

However, the introduction of the fourth condition —*increasing resistance against local restrictive measures when the virus spread is decreasing*— could hinder the action of this central government, requiring social communication campaigns or, more than that, the provision of material means to dampen the social and economic damage to sectors most impacted by the restrictive measures. A central government that assumed this role in a federation could make the disagreement and desertion risks irrelevant, mitigating the dissatisfaction of the economic and social sectors most affected by the "restrictions" and reducing their pressure on local governments for "flexibilization." But what if the central government did not assume such a role? What would happen if they omitted, or worse still, opposed, the restrictive measures adopted by subnational governments, including seeking to capitalize on the dissatisfaction of those economic and social sectors?

To outline an answer to these questions, we add the fourth condition by estimating the payoff obtained by M1 and M2 for three situations: *1*) decrease in cases, which corresponds to a gain of +2; *2*) moderate increase, which corresponds to a moderate loss of -1; and *3*) the accelerated increase corresponds to an intense loss of -4. Note that the + and - signs correspond to the benefit directness, therefore opposite to the direction of the curve in cases (up or down), and the numerical values express different intensities of this collective benefit. The costs of adopting restrictive measures would be represented as follows: *a)* in a decrease in cases, they correspond to -1; *b)* in moderate increase, they correspond to -0.5; and *c)* in accelerated increase, correspond to 0 (zero). These values reflect an ordinal classification between costs, the latter being residual given the magnitude of public commotion generated by increased cases and, consequently, deaths. Thus, accounted for, the costs and benefits for each situation are presented in Figure 6.

Next, we adopted the following procedures to estimate the payoffs at the end of the three extensive games shown in Figure 7: *1)* sum of benefits at the start and end of each municipality; *2)* subtraction of the strategy's costs adopted between the final and initial position. Thus, for example, a local government with a decrease in cases (benefit: +2) that reached the end of a moderate increase (benefit: -1), having chosen the "restriction" strategy (cost: -1.0) would receive a zero payoff (+ 2.0- 1.0-1.0 = 0). Another local government, also de-

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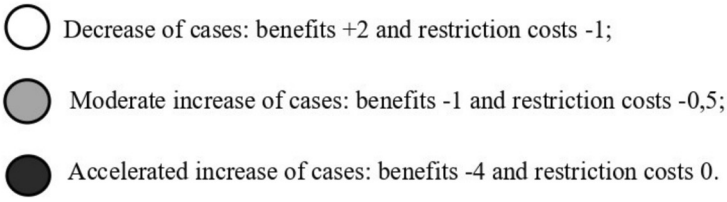
creasing (benefit: +2), but which maintained its situation (benefit: +2) after having spent the same (cost: -1.0), would receive a payoff +3.0 (+ 2.0+ 2.0-1.0 = 3.0).

Figure 6
Costs and benefits under different situations of local governments in the pandemic



Source: Figure by the author.

Figure 7 shows three different contexts in which M1 offers a collaboration proposal to M2, which opts for "restriction": *a)* when both are in decline; *b)* when M1 is in moderate increase and M2 is in decrease; and finally, *c)* when both are in moderate increase. It should be noted that both local governments in contexts A and C are in the same internal situation, while in context B they are in a different situation. Given the reduction proposed here and inherent to models of this type, and to analyze the distributive implications of cooperation between local governments under different conditions, we assume condition B as representative of cooperation between agents with non-coincident interests or preferences about the public good in the game.

Considering the dimension of convergence between agents' preferences regarding the public good, it should be noted that the rewards would be symmetric in cases where M1 and M2 start from identical initial situations - scenario A (+3.0; +3.0) and C (+0.5; +0.5) — but not when in a different initial situation— scenario B (+0.5; +3.0). In the latter, M1 comes out of a worse situation than M2 and would end up with fewer benefits than the latter in the end unless it adopted flexibilization in the second choice. The asymmetrical condition between local governments would represent situations in which they have different preferences regarding the opportunity to adopt restrictive measures based on them or to make them more flexible, considering the analysis of costs and benefits. For a local government in a situation of decrease, for example, the "restriction" could be less attractive because it has a higher cost. However, for another local government in a moderate increase situation, they could be perceived as necessary to avoid the imminent accelerated increase of contagion.

If what matters for Game Theory is not the situation estimated by the observer but that perceived by the interacting agents, two collaboration risks could emerge from this:

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1) If they can strategically anticipate the asymmetry of results, local governments could disagree with the opportunity to jointly adopt the restrictive measures even when convinced of their need, opting to preserve their autonomy to choose the preferred moment to adopt the "restriction" or "flexibilization";
2) If they are not capable of this anticipation, the most plausible scenario at the beginning of the pandemic would be that an eventual agreement between local governments could be broken when one of them perceives itself as disadvantaged.

In the first case, the asymmetry between local governments raises the risks of ex ante disagreement; in the second, it increases the risk of ex post desertion. Nevertheless, it is not discarded here that this is also possible in scenarios A and C, especially if we introduce two conditions not foreseen so far: in the first case, if one of the local governments is against the restrictive measures or in favor of restrictive measures for different ideological reasons from those advocated internationally; in the second case, if also for ideological reasons, the social and economic pressure is amplified for one of the local governments to the point of making its "potential electoral damage" greater than that faced by the neighbor. This means that disagreements or desertion risks could arise for political or ideological reasons even under symmetrical conditions between local governments: in the first case, they are introduced into intergovernmental relations; in the second, they are introduced into the intragovernmental arena.

In the matrices represented in the games in Figures 4 and 5, the challenge for the production of collective action between two local governments would be to mitigate the coordination risks between the restriction measures, which could be ensured by a central government that worked for this in the field of intergovernmental relations, offering parameters, monitoring and sharing information so that coordinated reactions take place at the appropriate time. They could also act in the communication and material provision fields, mitigating the disagreement risk between local managers or even the resistance of the economic and social sectors most affected by the restrictive measures. Central governments in European federations have moved in this direction despite different institutional obstacles (Hegele & Schnabel, 2021).

However, the disagreement and desertion risks are heightened in the absence of central government coordination, as illustrated by the matrices in Figure 7, especially when M1 and M2 are in different situations regarding the COVID-19 contagion curve. This organization pattern of local governments would tend to be unilateral, with each governmental entity seeking to maintain the autonomy to choose not only the intensity but also the adoption times of the restrictive measures, leading to a fragmented and ineffective reaction to contain the virus; something compatible with what was verified in the Brazilian, US and Mexican federations (Bennouna et al., 2021). Nevertheless, horizontal and regionalized cooperation initiatives detected in these cases would have been insufficient to perform precisely simi-

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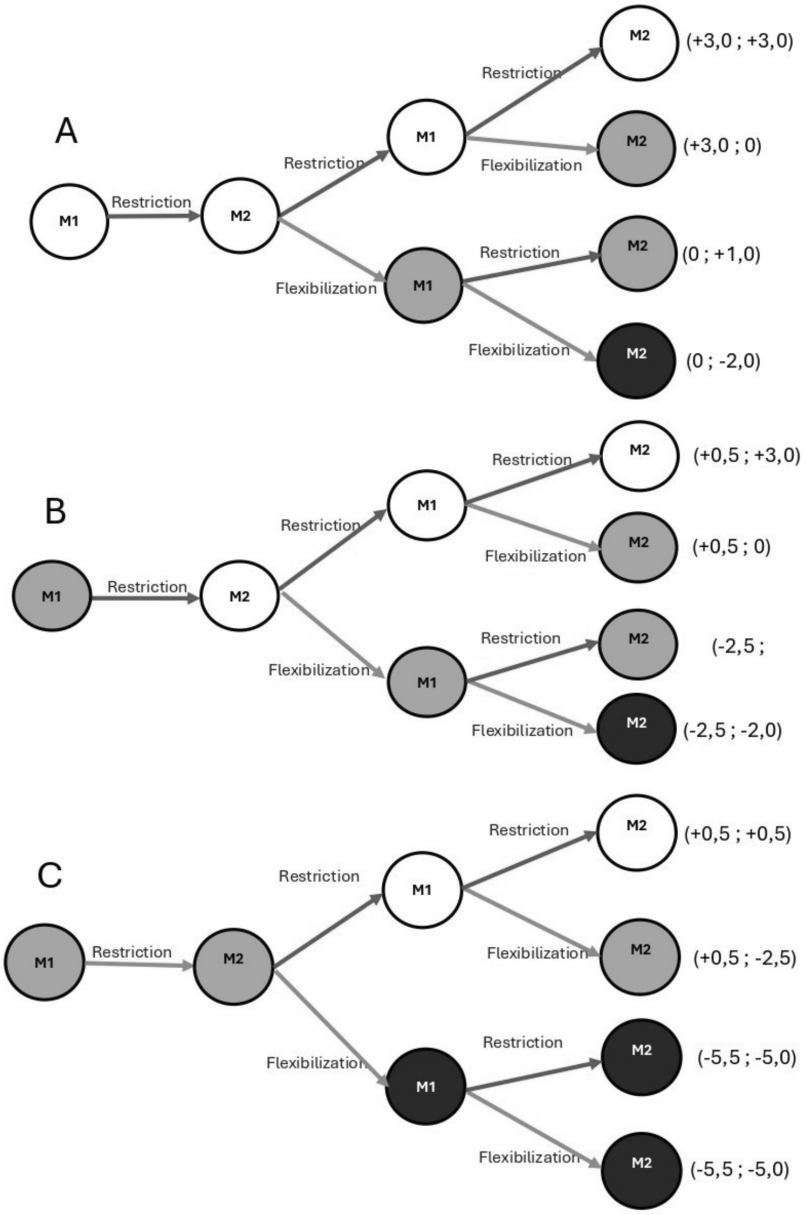
Figure 7
Interaction scenarios between M1 and M2, starting from the collaboration proposal offered by M1



Source: Figure by the author.

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larly to the European federations because it is the defense against COVID-19, a pure public good of national character and dependent on universal adhesion.

Next, we examine the extent of the findings of the extensive game model to one of the latter cases: Brazilian federalism. Our objective is to verify whether available empirical evidence on this case would endorse or not the arguments about the increased disagreement and desertion risks in the absence of central government conduct.

Brazil: a federation under the opposition of the central government in the fight against the COVID-19 pandemic

Brazil was one of the federations in which the central government did not assume coordination of national defense against COVID-19. In 2020, it was the second country on the planet in number of cases and deaths, and it was the world's epicenter of the pandemic in the first months of 2021. As in the United States and Mexico, the curve of cases and deaths in Brazil did not return to initial levels after the first wave, which only started in the second half of 2021 with the advance of vaccination.

Brazil is the largest country in Latin America in terms of population and territorial extension, and is a federation organized into three government levels, including 27 states and 5 570 municipalities. Unlike other federations in the Americas, such as the United States and Mexico, Brazil has a nationwide public health system in which entities linked to the three government levels have roles defined in legislation and are coordinated through mechanisms that include collegiate structures, with federative representation at the national, regional and local levels, as well as a conditional transfer scheme. Since the 1988 Constitution, this system has had a sectoral institutional arrangement built under the aegis of intergovernmental cooperation and the principles of universality, equality, and completeness in access to services for all citizens; however —unlike other Latin American federations— with broad powers for municipalities to act in the prevention, promotion, and recovery of health.

In addition, there are several possibilities for horizontal cooperation between subnational governments in the case of public problems, as in the case of intergovernmental consortia such as the Northeast Consortium, which brings together states belonging to this macro-region of the country. Inter-municipal consortia are present throughout the national territory, forming voluntary associations to produce and share public services and involving more than 4 000 municipalities united in 491 associations (CNM, 2018). Associations of municipalities constitute another horizontal cooperation mechanism, which are entities that bring together mayors at the state and national levels to politically represent their demands and establish different forms of technical collaboration (Abrucio, Filippim & Dieguez, 2013). On the other hand, regional health commissions are sectoral mechanisms formed by mu-

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nicipal health secretaries and with the participation of state managers to sign pacts within the scope of more than 430 health regions formally constituted within the scope of the Unified Health System (*Sistema Único de Saúde* - SUS) (Amaro, 2016). It is also worth noting the presence of associations between state or municipal health managers, such as the National Council of Health Secretaries (*Conselho Nacional de Secretários de Saúde* - CONASS) and the National Council of Municipal Health Secretariats (*Conselho Nacional de Secretarias Municipais de Saúde* - CONASEMS).

Since 2019, Brazil has been governed by an extreme right-wing president (Jair Bolsonaro) who took a stand against social policies enshrined in the 1988 Constitution and has denied the seriousness of the pandemic since the beginning, calling on the population to maintain productive activities normally. One of his most striking actions was the attempt to prevent states and municipalities from adopting non-pharmacological measures through the enactment of Provisional Measure 926/2000, which the Federal Supreme Court revoked in April 2020. Thus, states and municipalities were authorized to take viable measures to contain the virus spread (making Condition 1), but often under pressure from businessmen in the service sector and supporters of President Bolsonaro (Condition 4) (Moraes, 2021). Such pressures also affected local governments and governors, many of whom were allies of the President and began to follow his directions, undermining the cohesion of mayors and governors for coordinated actions (Condition 3) necessary in broader regions. It is worth noting that around 1 420 of the 5 570 Brazilian municipalities (or 25 %) are in Metropolitan Regions, where around half of the country's population lives (IPEA, 2021). The displacement between them is generally intense, and the choice between "restriction" or "flexibilization" under these conditions by local governments would potentially affect the regions in which they are inserted and not just themselves. This feature gives reasonable plausibility for considering Condition 2.

In these terms, the evolution of the number of cases and deaths was atypical, and the respective growth curves did not return to their initial levels after the first wave before resuming a strong acceleration in early 2021. In addition, the situation of states and municipalities alternated between a decrease and an increase in cases without stabilization or control of the pandemic. Faced with the refusal of coordination by the central government, several horizontal cooperation mechanisms were activated, but almost always for the associated acquisition of masks, respirators, and other supplies, or further, in the case of regional health commissions, in the assembly of outpatient care networks and hospitals for those affected by COVID-19. They were rarely involved in strategies for regionalized coordination of non-pharmacological measures.

In the case of these last measures, it should be noted that the central government refused to coordinate them and acted ostensibly against their adoption. While on the one hand, the President defended the use of ineffective drugs against COVID-19, he also

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made disqualifying statements against vaccines on the other (Calil, 2021; Bennouna et al., 2021). This behavior could be explained by adopting an institutional strategy for disseminating the virus by Bolsonaro, guided by the belief that in this way it could achieve "herd immunity" (Calil, 2021), having been based on three axes: *1*) an edit that it sets national standards against those promulgated by other government levels; *2*) actions, including in the legal field, to block responses from states and municipalities; *3*) propaganda against restriction measures advocated by health authorities and disinformation campaign on social networks (Cepedisa, 2021). Taking the extensive game shown in Figure 7, this third and last strategy could intensify internal pressures on local managers to make non-pharmacological measures more flexible, increasing the costs of their adoption or maintenance, which for the extensive game would be translated by the propensity to postpone or anticipate the exit of cooperative agreements with restrictive measures.

Studies already published in the country present data consistent with this hypothesis. Ximenes et al. (2021) started from the observation that, even in the period when the COVID-19 pandemic was growing in Northeast Brazil, the adoption of measures to flexibilize social distancing had already started to analyze its relevance considering the parameters of the World Health Organization. In analyzing the epidemiological situation of the nine capitals of the Northeastern states when the decision to increase flexibility was made, it was found that none met the parameters recommended by the WHO.

Lui et al. (2021) analyzed data from the National Confederation of Municipalities for August 2020 in another work focusing on municipalities. They found that 30 % among the 2 114 municipalities that relaxed restrictive measures at that time (out of 3 976 surveyed, meaning more than half) did so after less than one month, and 46 % after between one and two months, meaning that the restrictions in three-quarters of these municipalities lasted less than two months out of the five months of pandemic that had elapsed so far.

In turn, analyzing the restrictive measures adopted in the state of Santa Catarina, Caponi (2021) concluded that the initially successful pandemic management lost its effectiveness over time due to pressure from economic sectors, especially large businesspeople. The severity of the social distancing measures adopted by subnational governments decreased over time, especially when the second wave grew in the last months of 2020 (Moraes, 2021). Together, this evidence is consistent with condition 4, proposed in building the model presented in the previous section, that the maintenance costs of restrictive measures would grow with the tendency of decreasing cases and deaths, making the alternative of unilaterally anticipating measures tempting for flexibilization.

However, there is also suggestive evidence that the action in the ideological field by President Bolsonaro increased the risk of disagreement between local governments and strengthened unilateral and heterogeneous strategies, as Lui et al. (2021) described. It is

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suggestive in this regard, although not conclusive in our case, that in the local jurisdictions where Bolsonaro won the elections in 2018, the risks of infection and death were, respectively, 299 % and 415 % higher than where he was defeated (Cabral, Pongeluppe & Ito, 2021). Although indirect, an indication that would probably be faithful to scale the adhesion of local managers to the President's theses would be engagement in the so-called "early treatment" formed by a package of drugs without efficacy against COVID-19. This "treatment" had official adoption by a small part of the states and a good number of municipalities. For example, the state government in Rondônia distributed the medicine kit to all its municipalities (Government of the State of Rondônia, 2020), and it is notable that even where state governments did not adopt this policy, there was separate adhesion from several locations. In any case, the alignment with the President's speech by most subnational governments implied high disagreement risks regarding the selection, intensity, and timing for coordinated adoption of non-pharmacological measures.

In summary, the available evidence suggests that the President's overt action in Brazilian federalism against adopting non-pharmacological measures simultaneously increased the disagreement and desertion risk, increasing the costs of reaching agreements for horizontally coordinated action. The President acted to suppress official communication of data on the pandemic and bet on a disinformation campaign about the effectiveness of measures against the pandemic, favoring disagreement about the available alternatives for collaboration and generating uncertainty about the parameters of cooperation between local governments. On the other hand, editing conflicting norms and trying to legally block the action of states and municipalities against the pandemic increased legal uncertainty in the decision-making process. By instigating his support base against the restrictive measures by governors and mayors, he raised the costs of their adoption by local managers and, thus, the temptation of unilateral exits.

In this context, the virus always found a way to escape from one jurisdiction to another and spread where conditions were favorable to restart the contamination. This spread pattern caused by individual choices of local governments explains why the pandemic has not returned to lower levels of cases and deaths in Brazil. New propagation waves emerged before contagion stabilized at low levels. This is supported by the timing and horizontal progressivity in the evolution of COVID-19 in Brazil, as shown in Figure 8 below.

The period covers data since October 2020, when the source regularly made the map available in this format. In October, the pandemic regressed, reaching its lowest contamination level after the first wave. However, without being controlled, it progressively spread across the country from adjacent areas from the three foci in the North, South and Northeast regions. Areas where the contagion curve was descending were again vulnerable to a new wave of growth, given the spillover from these regions in the absence of nationally coordinated action by the central government.

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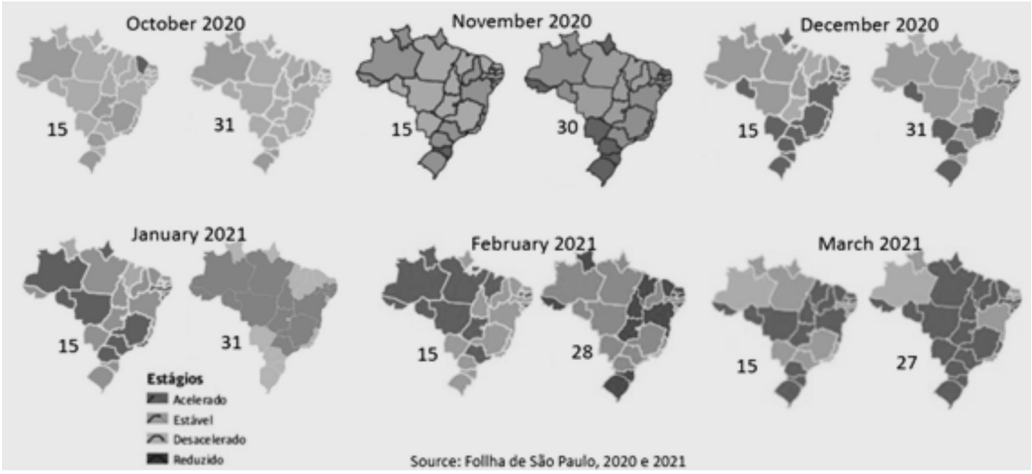
Figure 8
Evolution of the curve of COVID-19 cases in Brazil by state,
from October 2020 to March 2021



Source: Figure by the author.

Conclusion

Defense against the COVID-19 virus is a national public good requiring federations to solve a problem of collective action given the potential for inconsistent choices embedded in this form of territorial distribution of political authority. Different results were achieved in this regard: some federations obtained reasonable coordination levels or centralization of the national command of actions against the virus spread, while unilateral and fragmented responses from federated entities prevailed in others. Among the first —such as the European federations— the contagion curves returned to low levels before the availability of vaccines and still in the first wave, while in federations ruled by populist and denial presidents —like Brazil, the United States, and Mexico— they were reduced, but without returning to low levels before resuming growth again.

In this paper, we seek to clarify the nature of the risks and uncertainties involved in collective action problems in federations facing COVID-19 in two contexts: with and without central government coordination. Consistent with findings in the literature, we proposed a representation of these problems through games in the extensive form between two local governments to distinguish how the presence or absence of this coordination could affect the collaboration risks between them.

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In the end, we concluded that in federations in which central governments took the lead in confronting COVID-19, the collaboration risks boiled down to coordination risks, whose mitigation depended on the offer of national parameters and information sharing, as well as monitoring and decision-making oriented towards seeking adhesion from other government levels and society. On the other hand, other collaboration risks were incorporated in the federations in which the central governments refused to do this. In them, the probability of divergence risks (on the terms of cooperation) and desertion (considering already initiated cooperative actions) increased, something even more striking in the case of governments opposed to adopting non-pharmacological measures.

Under this last condition, by propagating ideologies that are denialist or ostensibly against restrictive measures, central governments would make the adoption costs even higher for local governments in two arenas: in the arena of relations with other governments, where it would increase divergence risks, in the domestic electoral arena, where it would amplify the desertion risks by emulating its supporters to press for the postponement of entry or anticipation of the exit of restrictive measures. This seems to have been the dominant pattern in the case of Brazilian federalism, a country whose healthcare system was constitutionally shaped around cooperative federalism and, unlike other federations on the American continent, based on municipal organization of services. The country, being governed by a denialist and populist President, had to deal with one of the biggest health crisis failures in facing the pandemic until vaccination coverage expansion at the end of 2021 reversed this situation.

COVID-19 thus brought important lessons about the problems of collective action and how the political choices of central governments can affect the chances of horizontal collaboration among other government entities in the federations. They do not necessarily underperform unitary countries, but once governed by denial and populist presidents, they would be under the low possibility of resistance from subnational governments, which is an important federative safeguard.

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