POLICY BRIEF

PB 20 - 38
April 2020

CRISIS CONTROL: THE USE OF SIMULATIONS FOR POLICY DECISION-MAKING

By Eduardo Haddad & Karina Bugarin

POLICY CENTER FOR THE NEW SOUTH
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Crisis Control: The Use of Simulations for Policy Decision-Making[1]

Eduardo Haddad[2] and Karina Bugarin[3]

Executive Summary

In face of the worldwide COVID-19 pandemic, use of evidence may be key to timely and precise decision-making. This policy brief explores the use of simulations in policy decision-making in the Brazilian State of São Paulo in fighting the COVID-19 pandemic. We draw briefly on the literature on evidence-based public policy to highlight the exacerbated need for timely decision-making and the role evidence plays in guiding high-level decision-makers amidst a crisis. We present examples of simulations that can substantiate top-level decision making, such as the assessment of the potential daily sectoral and regional economic costs of control strategies for mitigating the effects of COVID-19. Finally, the essential contextual elements of governance for informational use are provided as a set of recommended tools for policymakers.

Context or Scope of Problem

Since December 31, 2019, the world has seen the rise of an unforeseen crisis: COVID-19. From the first official notification by the Chinese authorities on the disease up to now, there have been 2.3 million reported cases and over 163,000 deaths[4]. However, it gets worse. The degree of uncertainty about the virus (for instance, mutations and re-incidence) is unmeasurable. The World Health Organization (WHO) and governments worldwide are adhering to lockdowns or reduced circulation measures that hinder economic activity.

Though there seems to be a consensus that restrictive measures—lockdowns or limited circulation—are needed as a containment strategy, there is little, if any, consensus on how long restrictive measures should last. Each day that goes by, lives are saved, but demand and supply in the economy suffer a deep blow. Furthermore, the rigidity of restrictive measures and their effects on the economy are not clear. This makes anticyclical policy design difficult. The intensity and duration of the measures must both be assessed considering the economic opportunity costs involved, and public policy should be oriented towards enabling a future economic comeback while preserving lives.

1. We are grateful to Inácio F. Araújo for providing excellent research assistance.

2. Professor of Economics, University of São Paulo, Brazil; Senior Fellow at the Policy Center for the New South, Morocco.

3. Researcher, Economics and Politics Research Group.

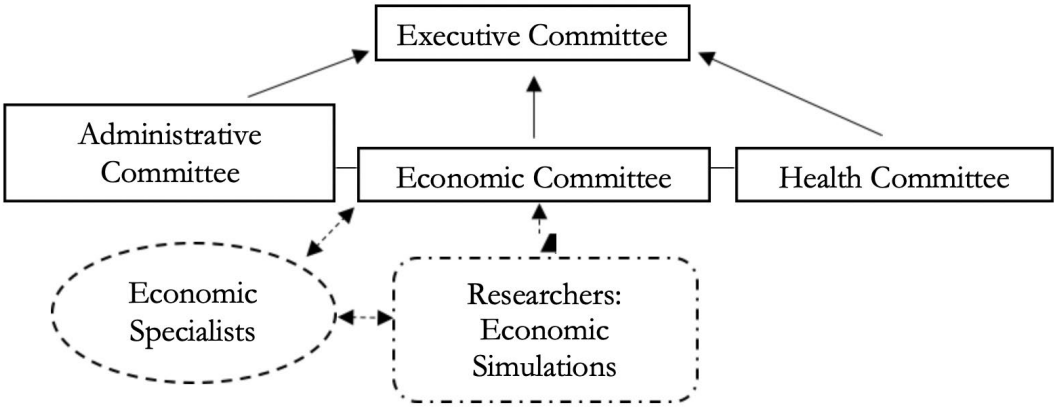
4. See https://coronavirus.jhu.edu/map.html, accessed on April 19, 2020.

This challenge heightens the need for evidence-based public policy to reduce informational asymmetry and to facilitate objective consensus between authorities. Several authors have explored this and have highlighted the need to establish a clear problem to tackle when using evidence for policy design[5]—the problem at hand being the assessment of the economic impacts of the COVID-19 pandemic. Simulations can be used to develop scenarios, reducing uncertainty and clearly establishing policy choice trade-offs.

Preparations to implement and roll back the lockdowns include setting up expert committees to examine initial control measures and define gradual relaxing of social restrictions (Box 1). Nonetheless, up against enormous uncertainties, combining epidemiological and socioeconomic simulation-based scenarios to examine ex-ante potential impacts is fundamental for informing officials before committing to a strategy. As a result, in the COVID-19 scenario for the Brazilian state of São Paulo, simulations are strictly useful to: (i) clearly delimit opportunity costs for different policy scenarios; and (ii) comply with budget reallocation rules set by external control agencies. In the first usage of simulations, timely decision-making may occur due to rapid and evidence-based answers. For policy guidelines, accounting for regional and sectoral aspects are critical. The political costs of imposing restrictive measures are evident, and the need to anchor expectations is crucial. The announcement of relaxation of the control measures is a key aspect to guaranteeing effectiveness of policies aimed at reducing the speed of the spread of the virus. The main argument revolves around health system capacity. Anchoring expectations is possible as long as the announcement is credible. Because health system capacity is the main point of restriction in adopting flexible measures, policymakers must factor into their analysis priority sectors and regions.

5. See Black, 2001; Brownson et al, 2009; Davies and Nutley, 2000.

Box 1. Committees and Economic Information Governance



To tackle the COVID-19 pandemic, the State of São Paulo has institutionalized specific multidisciplinary bodies on economic, health, and bureaucratic issues—committees. The three committees ultimately answer to the Executive Committee, led by the top executive decision-maker (vice governor). All bodies are expected to use information and data to subsidize policy recommendations oriented towards high-level stakeholder deliberation. The committees, though each responsible for a specific aspect, often exchange information to substantiate each other's decisions.

The Economic Committee uses simulation as its main tool for measuring economic impacts. The results of the empirical findings are used to design policy recommendations by joining the academic work of the University of São Paulo with the public-sector implementation knowledge of the Secretariat of Economic Development. The Economic Committee and the researchers directly consult economic specialists to increase precision of analysis. The researchers are responsible for designing and carrying out the economic simulations.

For the state of São Paulo, analysis was carried out to demonstrate which regions are most sensitive to the restrictive measures (Figure 1), and which sectors are most affected (Table 1).

Figure 1: Regional Economic Vulnerability to Lockdown Measures in São Paulo

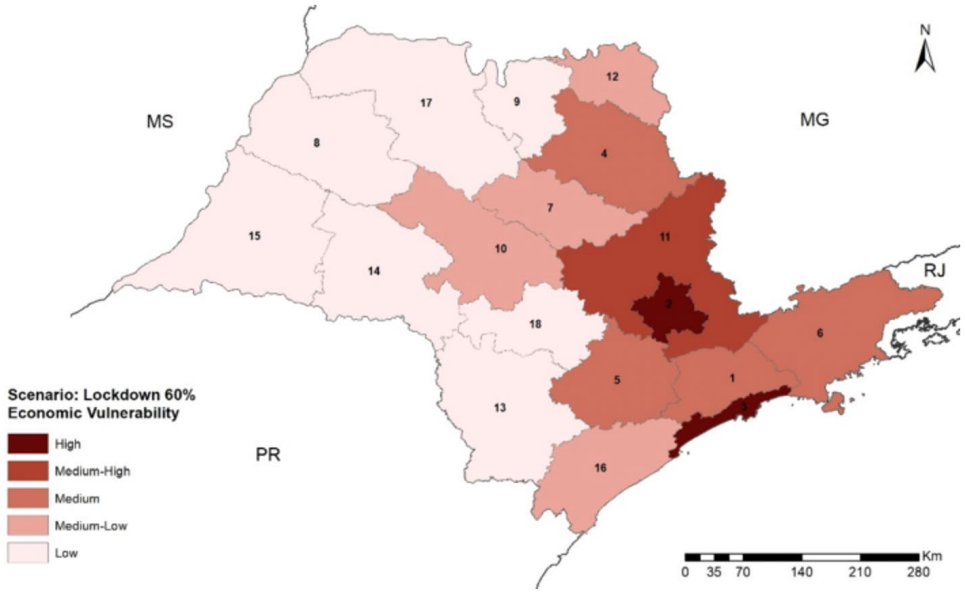


Table 1: Sectoral GDP Loss During Lockdown Measures in São Paulo

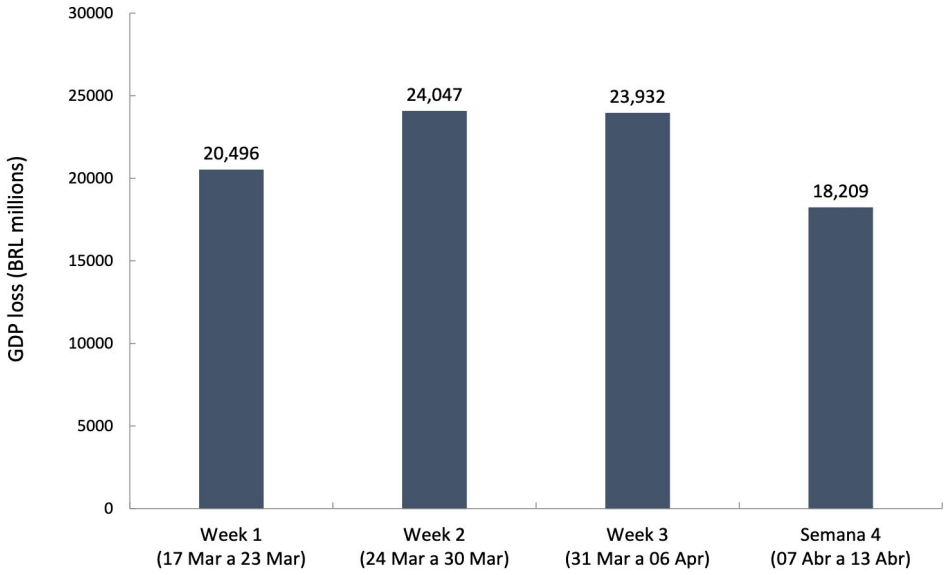
Region	*Agriculture*	*Manufacturing*	*Commerce*	*Public Admininstration*	*Other Services*	*TOTAL*
RM de São Paulo	57	3,830	6,941	586	35,881	47,295
RM de Campinas	63	1,493	1,154	74	4,671	7,455
RM da Baixada Santista	5	391	400	46	2,149	2,991
RM de Ribeirão Preto	79	276	524	37	1,655	2,572
RM de Sorocaba	79	779	626	36	1,859	3,379
RM do Vale do Paraíba	16	838	680	57	2,850	4,442
RA Central	40	268	257	18	880	1,463
RA de Araçatuba	61	156	204	15	595	1,031
RA de Barretos	33	93	130	10	401	666
RA de Bauru	52	307	315	24	1,027	1,725
RA de Campinas	125	1,454	1,439	68	4,193	7,279
RA de Franca	38	109	152	9	439	747
RA de Itapeva	106	49	120	6	230	511
RA de Marília	103	136	270	20	660	1,190
RA de Presidente Prudente	71	111	207	15	642	1,045
RA de Registro	29	52	85	4	220	389
RA de São José do Rio Preto	110	235	417	35	1,224	2,021
RA de Sorocaba	27	87	99	7	263	482
São Paulo	**1,093**	**10,663**	**14,021**	**1,067**	**59,839**	**86,684**
% of sectoral GDP	***3.43%***	***3.54%***	***5.28%***	***0.96%***	***4.76%***	***4.40%***

The main take-away from the regional and sectoral exercise is that the main losses are concentrated in the regions that most contribute to the state's GDP, which coincide with the most densely populated areas, and that the most affected sectors are labor and flow intensive. More densely populated regions are also the main vector for promoting contamination[6]. Therefore, a possible flexibility measure would be to loosen the grip in rural areas, pari pasu increasing restrictive measures in urban areas, while adopting a series of protocols in labor-intensive sectors with the aim of reducing contamination.

6. See http://covid19.fct.unesp.br/#detalhes-projetos, accessed on April 19, 2020.

The analysis must also consider time-related aspects. Considering the first four weeks of restrictive measures—from March 17 up to April 13 2020—, the economic costs are relatively constant: around 1% of annual GDP is lost per week (Figure 2). This adds an additional layer when computing the trade-offs between postponing the infection curve peak (avoiding health system capacity collapse) and economic productive losses. The main takeaway in this layer of analysis is that the current restrictive measures are not economically feasible for much longer.

Figure 2: GDP Loss per Week: São Paulo, March 17-April 13



As of April 2020, in spite of increasing awareness, there is still inadequate knowledge and poor perception by the public of COVID-19 in such places as the USA[7], while economic anxieties and the perceived severity of the economic crisis increased more rapidly after the arrival of the coronavirus. This is true particularly for individuals who worried not only about the aggregate economy but also about their personal economic situations[8]. We could speculate why this happens by comparing behavioral aspects of individual actions related to common events that affect people's everyday lives, such as concerns about job security, compared to their concerns about 'unlikely' events, such as death by a virus, especially for less-vulnerable demographic groups.

The mismatch between the cadence and intensity of the impacts of the pandemic event on the economy and its cadence and intensity in terms of mortality, revealed in simulation exercises, adds another layer of complexity for decision-makers. The mismatch, which is even more prominent in countries with more successful isolation measures, provides an opportunity for political pressures in favor of relaxing stricter control strategies. Different groups of discontents, e.g. those less vulnerable physiologically, and those more vulnerable economically, may encompass discourses and actions favoring the immediate abolition of measures of social distancing. This is particularly true in the Brazilian case, where, at the time of writing, there is strong divergence between the Federal government

7. See https://theconversation.com/americans-disagree-on-how-risky-the-coronavirus-is-but-most-are-changing-their-behavior-anyway-133991.

8. See https://voxeu.org/article/coronavirus-perceptions-and-economic-anxiety.

and local governments. The latter, led by the State of São Paulo, favor science-based measures of enhanced social distancing to avoid stressing the health system.

The regional, sector, and time-related economic costs highlight the need to act based on evidence. Considering a context with low technology adoption by the producers and consumers, restrictive measures that hinder the usage of innovative products and service delivery are particularly harmful, and a new set of policies is recommended to allow for reducing the spread of the virus beyond health system capacity while maintaining the capabilities of economic institutions for economic recovery post-crisis. Table 2 shows scenarios and possible policy recommendations. For all the scenarios illustrated, simulations are used to categorize and guide decision-makers.

Table 2: Critical Areas of Analysis and Policy Recommendations[9]

Aspects[10]		Regional Effects[11]	
		Concentrated Heterogeneity	Diffuse Heterogeneity

Sectoral Effects[12]	Concentrated Heterogeneity	• Territorially heterogeneous restrictive measures
		• Additional targeted sector support (for instance, payroll compensation, tax alleviation)
		• Large firm and consumer subsidies to counteract economic effects
		• Main restrictions:
		  • Policies are strongly limited due to economic feasibility of restrictive measures
		  • Restrictive policies may suffer from noncompliance due to coordinated political action
			• Territorially homogenous restrictive measures
			• Additional targeted sector support (for instance, payroll compensation, tax alleviation)
			• Large firm and consumer subsidies to counteract economic effects
			• Main restriction:
			  • Policies are strongly limited due to economic feasibility of restrictive measures

	Diffuse Heterogeneity	• Territorially heterogeneous restrictive measures
		• Main restriction:
		  • Restrictive policies may suffer from noncompliance due to coordinated political action
			• Territorially homogenous restrictive measures
			• Main restriction:
			  • Policies are strongly limited due to economic feasibility of restrictive measures

9. Policy recommendations are suggested based on countercyclical literature and World Bank and OECD evidence.

10. Aspects and scenarios are not exhaustive.

11. Regional effects are considered heterogeneous when there is a clear regional pattern, as in the case of the State of Sao Paulo, homogenous in the absence of clear geographical patterns regarding economic loss.

12. Sector effects are considered concentrated when a finite and small number of sectors account for over 50% of loss, as is the case for Sao Paulo, diffuse in the contrary case. This accounts for technology adoption in goods and service delivery.

Synthetic Policy Recommendation—Use of Simulation to Guide Decision-Making and Design a Policy Set to Counteract COVID-19 Effects

The need for timely and precise information has become an essential aspect of decision-making in the adoption of policies to counter the effects of COVID-19. The use of simulations plays an important role in reducing informational asymmetry and clearly laying out the trade-off between restrictive measures and economic activity. They set the path for policy design based on regional, sector, and economic production costs, restricted by the capacity of the health system.

Epidemiologic-economic integrated scenarios based on different durations and intensities of the control measures are also being used to help design sectoral and territorial-based policies to ease lockdowns, once there is a downward trend in the growth rate of new coronavirus infections. Simulation-based counterfactual exercises enable us to think clearly about the likely implications of events for which there is no direct experience in the historical record, revealing plausible directions of change and providing common-sense quantification.

The use of simulations to form more efficient and effective policy against COVID-19 requires: (i) public sector and academia alignment facilitated by knowledgeable public officials as anchors; (ii) the engagement of top decision-makers; and (iii) conveying of information to facilitate comprehension by top decision-makers.

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Table A1. Sectoral Economic Vulnerability to Lockdown Measures in São Paulo

Rank	Sector	Index	Vulnerability
1	Rental and leasing activities	1,000	High
2	Others administrative and support service activities	0,993	High
3	Publishing activities	0,988	High
4	Arts, entertainment and recreation	0,980	High
5	Accommodation	0,979	High
6	Real estate activities	0,979	High
7	Activities of membership organizations; Other personal service activities	0,977	High
8	Activities of households as employers	0,974	High
9	Air transport	0,943	High
10	Construction	0,890	Medium-High
11	Public Education	0,887	Medium-High
12	Land transport	0,882	Medium-High
13	Mining of coal and lignite	0,870	Medium-High
14	Printing and reproduction of recorded media	0,865	Medium-High
15	Warehousing and support activities for transportation	0,863	Medium-High
16	Manufacture of other non-metallic mineral products	0,842	Medium-High
17	Other professional, scientific and technical activities	0,841	Medium-High
18	Motion picture, video and television programme production	0,840	Medium-High
19	Legal and accounting activities; Activities of head offices	0,820	Medium-High
20	Water transport	0,809	Medium-High
21	Manufacture of coke and refined petroleum products	0,807	Medium-High
22	Wholesale and retail trade	0,806	Medium-High
23	Manufacture of chemicals; plastics and synthetic rubber in primary forms	0,787	Medium-High
24	Manufacture of fertilizers and pesticides and other agrochemical products	0,787	Medium-High
25	Manufacture of wood	0,778	Medium-High
26	Repair and installation of machinery and equipment	0,761	Medium-High
27	Manufacture of rubber and plastics products	0,757	Medium-High
28	Mining of iron ores	0,756	Medium-High
29	Food and beverage service activities	0,754	Medium-High
30	Architectural and engineering activities; Scientific research and development	0,746	Medium-High
31	Manufacture of fabricated metal products, except machinery and equipment	0,727	Medium-High
32	Manufacture of basic iron and steel	0,714	Medium-High
33	Manufacture of textiles	0,678	Medium
34	Manufacture of parts and accessories for motor vehicles	0,677	Medium
35	Manufacture of paper and paper products	0,654	Medium

Table A1 - Sectoral Economic Vulnerability to Lockdown Measures in São Paulo (cont.)

Rank	Sector	Index	Vulnerability
36	Agriculture and related service activities	0,647	Medium
37	Security and investigation activities	0,644	Medium
38	Private Education	0,641	Medium
39	Mining of non-ferrous metal ores and Mining support service activities	0,640	Medium
40	Manufacture of beverages	0,633	Medium
41	Animal production, hunting and related service activities	0,632	Medium
42	Manufacturing of Biofuel	0,611	Medium
43	Manufacture of electrical equipment	0,609	Medium
44	Manufacture of basic precious and other non-ferrous metals	0,605	Medium
45	Forestry and fishing	0,599	Medium
46	Extraction of crude petroleum and natural gas	0,580	Medium
47	Manufacture of other food products	0,553	Medium
48	Manufacture of sugar	0,548	Medium
49	Manufacture of soap and detergents, cleaning and polishing preparations	0,534	Medium
50	Manufacture of computer, electronic and optical products	0,533	Medium
51	Manufacture of machinery and equipment n.e.c.	0,518	Medium
52	Manufacture of wearing apparel	0,485	Medium-Low
53	Manufacture of furniture; Other manufacturing	0,482	Medium-Low
54	Processing and preserving of meat and fish	0,482	Medium-Low
55	Electricity, gas, steam and air conditioning supply	0,475	Medium-Low
56	Manufacture of pharmaceuticals	0,473	Medium-Low
57	Water collection, treatment and supply; Sewerage	0,469	Medium-Low
58	Manufacture of leather and related products	0,456	Medium-Low
59	Manufacture of tobacco products	0,435	Medium-Low
60	Manufacture of motor vehicles, trailers and semi-trailers	0,413	Medium-Low
61	Manufacture of other transport equipment	0,411	Medium-Low
62	Financial service activities; Insurance, reinsurance and pension funding	0,342	Medium-Low
63	Telecommunications	0,278	Low
64	Computer programming; Information service activities	0,263	Low
65	Public administration and defence; compulsory social security	0,053	Low
66	Private Health	0,019	Low
67	Public Health	0,000	Low

About the author, Eduardo A. Haddad

Eduardo A. Haddad is Full Professor at the Department of Economics at the University of São Paulo, Brazil, where he directs the Regional and Urban Economics Lab (NEREUS). He also holds a position as Affiliate Research Professor at the Regional Economics Applications Laboratory – REAL – at the University of Illinois at Urbana-Champaign, USA. He is a Senior Fellow at the Policy Center for the New South, Rabat, Morocco. Prof. Haddad has published widely in professional journals on regional and interregional input-output analysis, computable general equilibrium modeling, and various aspects of regional economic development in developing countries; he has also contributed with chapters in international books in the fields of regional science and economic development. His research focuses on large-scale modeling of multi-regional economic systems, with special interest in modeling integration applied to transportation, climate change and spatial interaction.

About the author, Karina Bugarin

Karina Bugarin is the Undersecretary of Productivity and Sustainable Development at the Secretariat for Economic Development in the State of São Paulo, Brazil. She is responsible for the design and implementation of strategic actions aiming at promoting socioeconomic development and reducing regional inequalities in the State. Karina Bugarin received her B.A. in Economics from Insper, Brazil, in 2008, and her M.A. in Economics from the University of Tsukuba, Japan, in 2011. She has worked at the Federal Governement as advisor in the Secretary of Strategic Affairs of the Presidency of Brazil and as a consultant for the World Bank. She is also a member at the Economics and Politics Research Group.

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Policy Center for the New South

Suncity Complex, Building C, Av. Addolb, Albortokal Street,
Hay Riad, Rabat, Maroc.
Email : contact@policycenter.ma
Phone : +212 (0) 537 54 04 04 / Fax : +212 (0) 537 71 31 54
Website : www.policycenter.ma

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