Public Choice (2022) 193:263–274
https://doi.org/10.1007/s11127-022-00992-4

Optimal lockdowns

David J. Hebert[1] · **Michael D. Curry**[1]

Received: 10 March 2022 / Accepted: 8 August 2022 / Published online: 7 September 2022

Abstract
This paper provides a framework for understanding optimal lockdowns and makes three contributions. First, it theoretically analyzes lockdown policies and argues that policy makers systematically enact too strict lockdowns because their incentives are misaligned with achieving desired ends and they cannot adapt to changing circumstances. Second, it provides a benchmark to determine how strongly policy makers in different locations should respond to COVID-19. Finally, it provides a framework for understanding how, when, and why lockdown policy is expected to change.

Keywords COVID-19 · Optimal policy · Planners' problem · Adaptability

JEL Classification D78 · D80 · I18 · I31

1 Introduction

This paper provides a framework for understanding optimal lockdowns in response to the COVID-19 pandemic (and similar events). It makes three contributions. First, it analyzes lockdown policies in general theoretically, arguing that policy makers systematically impose lockdowns that are too strict, too wide-reaching, or both because their incentives under political competition or in bureaucracies lead them to overestimate the costs to others of leaving one's home and underestimate the costs to the individuals forced to stay at home. Policy makers face weak incentives both to correct prior mistakes and to adapt to new information. Nothing in our analysis suggests that policy makers should do nothing or do not have roles to play in dealing with public health crises.

Second, our model provides a unique understanding of how strongly policy makers around the world should respond to COVID-19 (Bansak et al., 2021; Mittiga, 2022). Insofar as scholars speak of policy makers doing too much or too little, a benchmark is essential for making meaningful comparisons. Our model provides a benchmark that allows us to explain differences in policies across countries or regions. For example, our model finds that weak

✉ David J. Hebert
djh005@aquinas.edu

Michael D. Curry
mdc004@aquinas.edu

1 Aquinas College, Grand Rapids, MI, USA

lockdown policies are optimal where tourism is minimal, the population is stable, and vaccination rates are high.

Third, our model provides a framework for understanding when and how policies should change. A broad consensus holds that some pandemic policy response is necessary given the nature of pandemics and human behavior. But few scholars acknowledge that changes in policy are appropriate when pandemic conditions change. In contrast, our model shows why if a COVID-19 variant were to emerge that is deadlier, more communicable, and more resistant to vaccines, imposing stricter policies could be warranted. Our model also provides a framework for understanding when and why specific policy requirements should be relaxed.

We do not assume that policy makers suffer from irrationality, limited cognitive abilities, malintent, ignorance, or any other behavioral failure. Our conclusion that state-imposed lockdown policies have been too strict follows instead from the epistemic and incentive constraints faced by policy makers.

COVID-19 is an epidemiological problem. We are not epidemiologists, but insights from economics and political science, and particularly from public choice, can help assess the efficacy of responses to the crisis (all of which involve tradeoffs) and what we can learn in preparation for future crises. Public choice theory—specifically the interest-group approach—rarely has been applied to matters of public health (Leeson & Thompson, 2021; Tollison & Wagner, 1991). The paper in hand helps rectify that neglect.

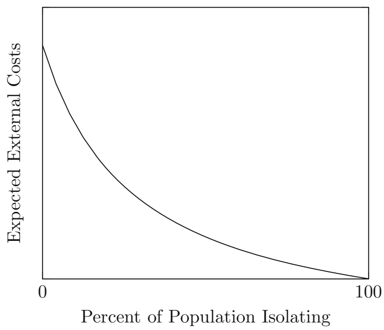
The paper proceeds as follows: In Sect. 2, we apply Buchanan and Tullock's (1962) model of majority-rule thresholds to COVID-19 policy and outline the insights that can be gleaned from doing so. We also lay out two conditions under which lockdown policies will be too strict relative to what we term an "optimal lockdown". In Sect. 3, we identify two issues faced by policy makers—namely, misaligned incentives and inflexibility—and how they lead to overly strict lockdown policies. Section 4 reports evidence on COVID-19 and the issues raised in Sect. 3 and applies it to our model. Section 5 offers concluding remarks and pathways for future research.

2 The model

Buchanan and Tullock (1962) formulate a framework for thinking about social choices in a world in which our private choices impose costs on others and all people in a group are subject to the same collective decision. While they apply their framework to efficient majority-rule voting thresholds, it readily can be brought to bear on the pandemic and optimal pandemic responses. In this section, we lay out a theoretical case for lockdowns, identify their costs, and arrive at a framework for determining an optimal lockdown. As Gallic et al. (2021) argue, specifying the maximand is critical when evaluating policy performance. Here, although many policy makers have stated an unrealistic goal of zero COVID-19 infections, we make the charitable assumption that they are attempting to minimize both the physiological harms (including death) from COVID-19 and the "nontrivial psychological and economic consequences" (Gallic et al., 2021) of lockdowns. Relaxing that assumption only makes our conclusion stronger. Regardless, our model could be applied to contexts with different maximands with slight modifications.

We start by observing that a person infected with a highly contagious and potentially deadly disease imposes costs on the people around them by leaving their home and possibly exposing others to infection. In an ideal world, we would identify infected people and isolate them from the rest of the population so that they do not spread the disease. That was done with

Fig. 1 External Costs



the H1N1 novel influenza virus in 2009. Quarantines worked very well because all people who contracted the disease presented obvious symptoms and no one who was not symptomatic was contagious. H1N1's morbidity properties made identifying and quarantining the infected population easy and helped limit the disease's spread. After all, if a virus cannot spread to new hosts, it will die out quickly because either the hosts die or their immune systems counter the virus successfully. As a result, an H1N1 pandemic was averted.

COVID-19 is different. People exposed to the coronavirus can be infectious for up to two weeks before they show symptoms if they ever do. Identifying infected people requires testing, which is expensive and time-consuming. Throughout the pandemic, not enough tests were available for testing everyone regularly, and reliable data on the accuracy of COVID-19 testing (that is, false positives and false negatives) are not widely known. Many people, even more than 24 months into the pandemic, have not received even a single test. The upshot is that everyone may have been exposed to COVID-19 and everyone walking around outside their homes is a potential source of disease spread. The larger is the number of untested, infected and contagious people, the greater is the potential cost to society. That cost is external in that it is imposed on others (most notably the elderly, the obese, and other at-risk populations) by people who do not quarantine or otherwise isolate themselves. If zero people are isolating at home, then the external costs are at their highest. Conversely, if every contagious person is quarantined, the costs are at a minimum. Figure 1 illustrates the tradeoff.

Lockdowns also impose costs on the people isolating at home and the businesses forced to close or to operate at less-than-optimal capacities. While they prevent people from consuming some goods (for example, from exercise facilities or public schools), they do not explicitly prevent people from consuming most goods. They do, however, raise the transaction cost of doing so. We define "transaction cost" as Allen (1991) does: "the cost of organizing, engaging in, or completing a transaction." Lockdowns bring other costs too. For example, limiting interactions with people outside the home leads to feelings of isolation and loneliness, which are highly correlated with depression, anxiety, adult morbidity, chronic disease, and suicide. Fear of exposure to COVID-19 caused many people to avoid or defer routine medical care. Left unchecked, lockdowns contribute to premature mortality and declining mental, emotional, and physical well-being. Additionally, we can gauge the intrahousehold-conflict costs of lockdowns. Being stuck at home, even with loved ones, can increase the likelihood of conflict in the form of physical abuse, emotional-psychological abuse, or both; child abuse can go unreported because most such cases are first identified by teachers and school nurses. We refer to those costs as internal because they are incurred by the people being isolated. With zero people quarantined at home, the costs are minimized. Conversely, if every person is isolated at home, then the internal costs are maximized. Figure 2 illustrates the relationship.

Fig. 2 Internal Costs

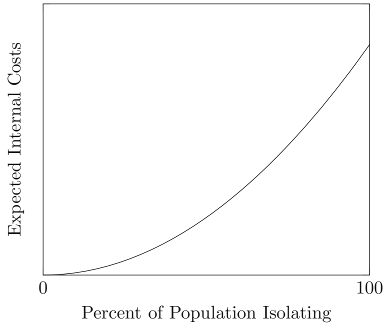
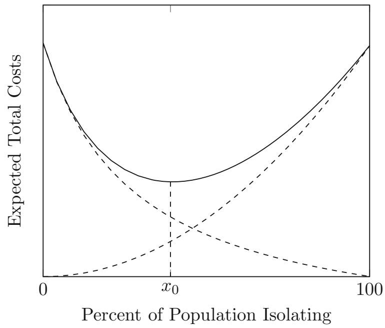


Fig. 3 Total Costs



Identifying an optimal lockdown requires accounting for both internal and external costs. Doing so, as Buchanan and Tullock (1962) demonstrate, is straightforward: sum the external and internal costs vertically, and minimize the total.

To demonstrate that policy makers during the pandemic selected policies that were too strict, we must show at least one of two conditions to be true:

Condition 1: The external costs of COVID-19 were lower than what policy makers believed or acknowledged.

Condition 2: The internal costs of lockdown policies exceeded what policy makers believed or acknowledged.

If either condition was satisfied, policy makers selected a lockdown that was stricter than optimal. In the next section, we argue that both conditions were satisfied.

3 The realities of political planning

In an ideal world, politics would be an arena wherein a group of people with different perspectives, values, and beliefs come together to engage in a respectful exchange of opinions. The exchange would determine what the group would do and would bind the behavior of all members, even those who disagree with the collective decision. Unfortunately, as explored in Tullock (1965) and, more recently, Wagner (2016), politics in practice is an arena wherein self-interested political officeholders and organizations compete for limited resources. Those actors operate outside the bounds of the market's profit-and-loss system. Absent a bottom line, bureaucracies are judged along two dimensions: the sizes of their staffs and the sizes of their budgets. In a global pandemic affecting nearly every aspect of our lives, virtually every bureaucracy has strong reason to make the case that it needs additional funds to address the challenges it will face.

To secure the additional funds, bureaucracies, like private firms, must approach financiers. But whereas private firms must secure financial support either from banks or other investors, bureaucracies secure funds through legislative appropriation processes. They must submit budget requests, supported by reports and analyses that establish what bad outcomes will result if the requests are denied and what good outcomes will result if the requests are approved. More specifically, they must undertake benefit–cost analyses, exercises mandated for "major" rules by executive orders issued by every US president since at least Ronald Reagan. However, as Johnston (2012) and Dudley and Peacock (2017) document, benefit–cost analyses are fraught with institutional problems that prevent them from being effective tools of public sector management. For example, because the bureaucracy requesting the resources is the same bureaucracy producing the analysis, it has a strong tendency to overstate the benefits of additional funding while downplaying the costs to make the request seem fiscally responsible and more reasonable. Dudley and Peacock (2017) describe that bias as "identifying co-benefits without searching for corresponding co-costs." The bureaucracy requesting the resources identifies the primary benefits that will ensue if its request is approved and goes to great lengths to document secondary, spillover benefits. It also ascertains the primary costs of its requests but does not identify any secondary, spillover costs.

In the context of COVID-19, the bias is clear. Advocates of lockdown policies might point out that, by encouraging people to stay home to stay safe, not only will the spread of the virus be contained but carbon emissions will be reduced because fewer people will be on the road; they thus place lower emissions on the benefits side of the analysis and emphasize that less commuting and shopping will generate co-benefits in the forms of better air quality and associated lower health risks. They will not, however, point to the co-costs of lockdowns listed above, which are more difficult to detect and quantify. The cost side of the analysis therefore is left incomplete, whether intentionally or not.

Bureaucracies enjoy another advantage over their private sector counterparts, as Dudley and Mannix (2019, p. 1) emphasize: the lack of "ex post evaluation of ex ante estimates of benefits and costs." Investors in private profit-seeking firms expect positive returns on their funds over some time horizon. If a firm is unable to meet its obligations to its investors, the suppliers of capital can cut their losses (though perhaps not fully) and the managers' reputations will be damaged. With bureaucracies, however, no such mechanism, reputational or otherwise, exists. Bureaucrats are judged based on the budgetary requests that are approved, not on the efficacy of their spending proposals.

The question is what kinds of mistakes are most easily quantified. In the case of a global pandemic, the easiest metric is suffering and death caused by the virus. At the outset of the pandemic, deaths *from* COVID-19 were conflated with deaths *associated with* COVID-19; moreover, total mortality was confused with excess mortality. Given the uncertainty surrounding a novel virus, a too lenient lockdown appeared to risk causing more people to suffer and die than a too strict lockdown; a too strict lockdown appeared to merely risk making people's lives slightly harder for a short period. Thus, the choice for policy makers was clear: lock down early and lock down hard. That choice is especially problematic when controversial policy decisions supposedly are based on scientific evidence, which Wagner (1995) refers to as the "science charade" because anyone who makes a mistake can be excused as "following the science", which always is provisional and rarely is settled.

Finally, in a world in which decisions are made based on projections, mistakes are inevitable because of the ever-present fog of the future and continuously changing market and nonmarket dynamics. Harford (2011) and Coyne (2012) both discuss forecasting as an issue of adaptability, which Coyne defines as "the ability of people and organizations to learn from their mistakes and make the necessary changes to be successful." While Coyne is describing the abysmal outcomes of state-led humanitarian efforts, the logic of his argument applies here as well. And when mistakes are made, corrections are necessary. If policy errors are not corrected, then an argument can be made that the actual "unintended consequences" must have been intended (Stigler, 1971, 1975).

As a possible explanation for the failure to adapt to changing conditions and knowledge related to the pandemic, consider Smith's (1759) notion of "the man of system". For the man of system, adaptation is not necessary because experts are presumed have access to all the knowledge and information required to identify what must be done and the resources essential for getting the job done. Consider the rise in popularity of Dr. Anthony Fauci in the United States. Prior to 2020, few people had heard of Dr. Fauci, despite his impressive resume. Today, he is a household name, and, at least in the United States, many policy makers once waited with bated breath to hear his latest pronouncements. When COVID-19 cases and deaths continued to rise despite lockdown policies, virtually no one stopped to ask whether lockdowns were effective. Instead, experts attributed the persistence of the pandemic to ordinary people not taking the restrictions seriously and local officials not having the resources to enforce them.

In this section, we presented reasons why fully rational policy makers would adopt lockdown policies that are stricter than optimal: (1) the incentives they face (namely, to overstate the benefits and understate the costs of lockdowns); (2) their inability to adapt to changing knowledge and information.

4 Wrong curves, wrong policy

Herein, we explain in greater detail why the policy responses to COVID-19 tended to be overly restrictive. In doing so, we ask why policy makers overstated the external costs of disease and understated the internal costs of their lockdown policy responses.

4.1 COVID-19: Less externally costly than policy makers grasped

During the pandemic, policy makers around the world converged on conventional behavioral pandemic models. Such models, popular in the field of epidemiology, assume that people interact with others at random and that the physical spaces in which the interactions take place have limited (if any) ability to limit externality-causing behaviors. However, such models are flawed. Chowell et al. (2016) find that they systematically overestimate the spread of disease. Eskin et al. (2019) extends that finding by noting that behavioral changes in response to disease prevalence and transmission rates reduce the spread rate below that which is predicted by standard behavioral pandemic models. Human beings are not inert chessboard pieces; they have minds of their own and respond rationally to the information available to them. People, especially those at high risk, can take steps to avoid exposure to transmittable diseases. Winsberg et al. (2020) contend that "it is unsurprising to find a great deal of evidence from past experiences that epidemiologists favor a balance of inductive risks that leads to over-forecasting the severity of diseases. The infection fatality rate[s] of Mad Cow Disease, H1N1, H5N1, H7N9, and MERS all were considerably lower than what epidemiologists predicted. And while SARS 2002 ended up being twice as fatal as originally predicted, its infectious spread was tiny compared to what they predicted." In other words, epidemiologists have penchants for predicting faster and wider disease spread ex ante than is observed ex post. Even altruistic policy makers, relying on projections gleaned from models that ignore human action, would behave in ways consistent with the belief that the external costs of COVID-19 were greater than they in fact were.

Future studies relying on the epidemiological models applied to COVID-19 likely will be consistent with the reasoning of Chowell et al. (2016), Eskin et al. (2019), and Winsberg et al. (2020), namely that these models systematically overestimated the transmission rates of COVID-19 and that private behavioral changes unanticipated by the models acted to reduce the virus's spread. Leeson and Rouanet (2021), for example, argue that private incentives were powerful enough to mitigate most (if not all) of the externalities associated with not isolating at home. Dave et al. (2020) report evidence that social-distancing measures were pointless by examining the effect of the Wisconsin Supreme Court's decision to abolish the state's Safer at Home order. Goolsbee and Syverson (2020), using cell phone records, find a roughly 60% decline in vehicular-traffic volume and report that legal restrictions explain only about 7% of the total reduction, with the remaining 53% explained by voluntary action. Moreover, traffic started to lessen before policy requirements were enacted, and the decline was correlated positively with the number of COVID-19 deaths in the United States, suggesting that people assessed the risks of leaving their homes accurately even as public policies responded slowly to news of COVID-19's spread. Luther (2020), relying on Google's COVID-19 Community Mobility Reports, reports evidence that much of the change in people's behavior in early 2020 was evident prior to the enactment of lockdown policies. Hardingham-Gill (2020) documents how Qatar Airways responded (in hindsight, overreacted) to the pandemic by requiring flight attendants to wear hazmat suits to protect both themselves and passengers. Halkias (2020) and Khazan (2020) discuss the practices adopted by grocery stores to ensure shoppers' safety. In short, while epidemiological models presume a total lack of private response to public health crises, the evidence suggests otherwise.

A second reason why policy makers acted as if the external costs were higher than they actually were can be found in the distinction between type I and type II errors. In many cases, the US Food and Drug Administration (FDA), which is responsible for approving or rejecting new pharmacological and therapeutic treatments for public use, arrives at the correct answer: approving drugs and treatments that are safe and rejecting drugs and treatments that are unsafe. At other times, however, the agency is wrong or the right answer is delayed.

The victims of the FDA's type I mistakes are identified easily (e.g., thalidomide) and fault clearly can be assigned. In the case of type II errors, however, the victims often are unknowable, leading to the "invisible graveyard" of people who could have been saved had the FDA approved a drug sooner (Tabarrok 2015). Eliminating both types of error is an impossible goal: reducing one leads to an increase in the prevalence of the other. Isakov et al. (2019) confirm, from the US Burden of Disease Study, the FDA's bias toward avoiding type I errors and thus committing more type II errors.

In the context of COVID-19, policy makers plausibly instituted too strict lockdowns to avoid committing a type I error because deaths from COVID-19 and hospitalizations of infected patients easily are countable. March (2021) explores the correlation in the context of COVID-19 specifically and finds that "the FDA's regulations enacted before the COVID-19 pandemic began strongly restricted clinician and patient access to COVID-19 testing, remdesivir, and vaccines. After the FDA issued EUAs [emergency use authorizations], the

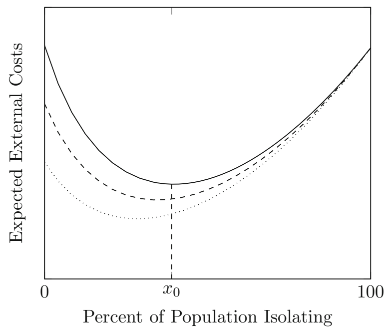


Fig. 4 Effect of Exaggerated External Costs on Total Costs

healthcare sector quickly adopted COVID-19 testing and remdesivir with little evidence of negative consequences."

The external costs that policy makers considered exceeded the true external costs. Thus, Condition 1 is satisfied. Figure 4 illustrates three total-cost curves based on different levels of external costs, with the solid curve representing the more exaggerated external costs, the dashed line the less exaggerated, and the dotted line unexaggerated.

4.2 Lockdowns: more internally costly than policy makers realize

In addition to the overstated external costs of lockdowns, the internal costs of lockdowns were much higher than policy makers realized. In the United States, the Cybersecurity and Infrastructure Security Agency within the Department of Homeland Security promulgated the guidelines regarding which sectors of the economy should be deemed "essential" and, hence, exempt from closure. On the surface, the determination of "essentialness" might be very straightforward. Who could argue that, for example, food, shelter, utilities, and medical care are not essential during a pandemic? Indeed, this is not the first time that policy makers have declared some businesses "essential" and others implicitly unessential. In 1917, for example, the Selective Service Act in the United States declared workers presently employed in the agricultural and defense-related sectors exempt from being drafted into the U.S. Army due to the essential nature of their output to war efforts. But Storr et al., (2021, p. 3) argue policy makers face tremendous difficulty in understanding the complexities of our social world. Specifically, policy makers "do not and cannot fully understand the complex production processes that lead to the final goods and services that may be essential." That conclusion harkens to Smith's (1759) "man of system". We see the disastrous results of policy makers' hubris most clearly in the context of disruptions to global supply chains. The disruptions were not caused by the pandemic but by policy makers.

Further, a growing body of evidence suggests the incidence of mental health disorders increased greatly because of government measures designed to slow the spread of COVID-19 (Boylan, 2020). The Centers for Disease Control and Prevention reports that the share of the US population who report symptoms of depression or anxiety rose by as much as 40% during the pandemic compared to a mere 11% increase during a similar time frame in 2019 (Centers for Disease Control & Prevention, 2020). The number of internet searches related to mental health—suicidal intentions, in particular—also increased sharply during the pandemic (Jacobson et al., 2020). Altindag et al. (2022) report evidence from the Turkish policy response that the mental health burdens of being forced to isolate were greater than the costs of the pandemic itself. Adams-Prassl et al. (2022), estimating a difference-in-differences

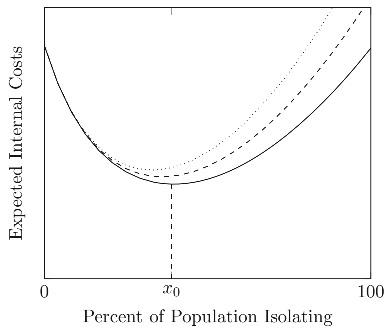


Fig. 5 Effect of Underestimated Internal Costs on Total Cost

model based on data collected in March 2020 and April 2020 from employed adults living in the United States, find that mental health scores of individuals living in states with lockdowns were 0.85 standard deviations lower than in states without lockdowns. Armbruster and Klotzbucher (2020), looking at data from Germany, find a 20% rise in counseling requests during the week of lockdown and even larger increases in areas with stricter measures. Ravindran and Shah (2020) collect data from India and find evidence for what UN Women calls the “shadow pandemic” of domestic-violence complaints. Such complaints rose more in areas with the strictest lockdowns, and the increase persisted a full year into the pandemic.

Finally, several of the internal costs of lockdown policies might not become apparent for years to come. For example, many hospitals around the United States banned or delayed elective surgeries during the pandemic. While the term “elective” implies that the surgeries were somehow optional, patients nonetheless sought them to alleviate suffering. Another option for alleviating suffering is to use opiates or other pain medications; evidence suggests that opioid prescriptions have risen dramatically during the pandemic (Redford & Dills, 2021). Reporting on preliminary findings of fatal opioid death rates, Mulligan (2020) suggests that opioid overdose deaths increased by 10% to 60% from the start of the pandemic through October of 2020, particularly in areas with stricter lockdown policies.

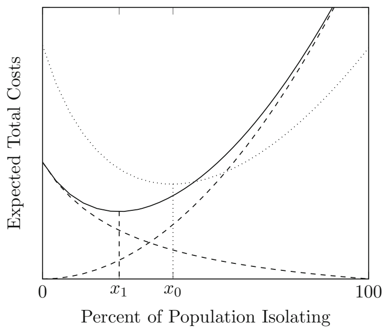
Moreover, there is also a growing literature on the underpreparedness of students entering college after two years of remote or otherwise disrupted learning (Kuhfeld et al., 2022). Jack et al. (forthcoming), looking at district-level schooling data in the United States for grades 3–8 found significantly larger declines in math and English language arts pass rates in districts forced to provide remote learning compared to those that were allowed to remain in-person.

Insofar as the secondary effects were not factored into policy makers’ considerations ex ante, the internal cost of lockdown policies was greater than policy makers presumed. Thus, Condition 2 was satisfied as well. Figure 5 illustrates three total-cost curves based on different levels of internal costs, with the solid curve representing the more underestimated internal costs, the dashed line the less underestimated internal costs, and the dotted line the true internal costs.

5 Putting it all together

The preceding discussion points to two conclusions: First, the external costs of a pandemic are likely to be lower than what policy makers believe when designing mandated nonpharmaceutical interventions. Second, the internal costs of these interventions are likely to be higher than policy makers anticipate.

Fig. 6 Total Effects on Total Cost of Lockdowns



In Fig. 6, the dotted line represents the total-cost function from Sect. 2 while the dashed lines represent the exaggerated external-cost and understated internal-cost curves from Sect. 4. The solid total-cost line is the total of the two dashed lines. In the figure, the total cost of the lockdown is less than shown previously, but the opposite would be true if the external costs rose more than the internal costs fell. Either way, the minimum of the new total-cost curve occurs at a less stringent lockdown than in the original total-cost curve.

We are not the only scholars to question the necessity of mandated so-called NPIs (non-pharmaceutical interventions). Atkeson et al. (2020), for example, argue that "voluntary social distancing, the network structure of human interaction, and the nature of the disease itself" played a crucial role in declining transmission rates. Additionally, their findings "further raise doubt about the importance of nonpharmaceutical interventions (lockdown policies in particular) in accounting for the evolution of COVID-19 transmission rates over time and across locations."

6 Conclusion

Applying economics to the process by which political decisions are made and to the incentive and epistemic problems policy makers actually face allows us to make useful pattern predictions. Our model provides a framework for understanding how and when lockdown policies will change. For example, in the unlikely event that the COVID-19 virus evolves into more deadly and more communicable variants, the external-cost curve will rotate upward, which will move the minimum of our two cost curves to the right; that is, it will justify stricter lockdowns. Conversely, if COVID-19 fades away or new variants emerge that are less deadly or less communicable, the external-cost curve will rotate downward, which will move the minimum of the two cost curves to the left; that is, it will justify less strict lockdowns. Our model can also be used to understand how COVID-19 policies change in response to other events, such as the availability of vaccines. All else being equal, our model predicts that when a larger percentage of the population in a particular location is vaccinated, the external-cost curve will rotate downward, thus justifying less strict lockdowns. Regarding areas that prime tourism destinations (for example, winter ski-resorts and warm weather beach towns in the United States) and that do not implement vaccination requirements, we expect that the external-cost curve will rotate upward as tourist season begins and public officials will, therefore, be justified in implementing stricter lockdown policies. And while it may be prudent to reduce lockdown stringency slowly when external costs fall, we expect that if the external costs were to rise predictably, as in the case of tourist destinations, local or state policy makers would respond by increasing lockdown stringency. Our model highlights the need for additional research to understand why local and state policy makers sometimes fail to rationally respond to a predictable problem.

For two reasons, we did not offer empirical evidence that lockdown policies have been too strict: first, we wanted to avoid the charge of cherry-picking; and second, to the best of our knowledge, the data necessary to make such a claim do not exist yet. What we provided instead is a framework for scholars to apply in case studies to better understand situations in which lockdown policy did or did not depart from the optimal.

Finally, we acknowledge that we did not consider that policy responses can be targeted along demographic lines—for example, toward older or other more susceptible populations. Given that the policy responses in most countries around the world were not targeted narrowly at vulnerable population segments, but rather applied to everyone, we do not think that consideration was relevant.

Acknowledgements The authors are grateful for seminar participants at Troy University and Aquinas College, to conference attendees at The Association of Private Enterprise Education meetings, and to two anonymous referees for helpful comments on earlier drafts. We also wish to thank Peter Leeson and Kevin Grier for their insightful discussions toward the beginning of writing this paper. All remaining errors are our own.

Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

References

Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2022). The impact of the Coronavirus lockdown on mental health: Evidence from the US. *Economic Policy, 37*, 139–155.

Allen, D. (1991). What are transaction costs? *Research in Law and Economics, 14*, 1–18.

Altindag, O., Erten, B., & Keskin, P. (2022). Mental health costs of lockdowns: Evidence from age-specific curfews in Turkey. *American Economic Journal: Applied Economics, 14*, 320–343.

Armbruster, S., & Klotzbucher, V., (2020). Lost in lockdown? COVID-19, social distancing, and mental health in Germany, Technical Report.

Atkeson, A., Kopecky, K., & Zha, T. (2020). Four stylized facts about COVID-19, Working Paper 27719, National Bureau of Economic Research.

Bansak, K., Bechtel, M., & Margalit, Y. (2021). Why austerity? The mass politics of a contested policy. *American Political Science Review, 115*, 486–505.

Boylan, J. (2020). The Coronavirus mental health crisis hits home, The New York Times.

Buchanan, J., & Tullock., G. (1962). *The calculus of consent: Logical foundations of constitutional democracy*. Liberty Fund.

Centers for Disease Control and Prevention (2020). Mental health: Household pulse survey. Retrieved April 7 2022 from https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm

Chowell, G., Sattenspiel, L., Bansal, S., & Viboud, C. (2016). Mathematical models to characterize early epidemic growth: A review. *Physical Life Review, 18*, 66–97.

Coyne, C. (2012). *Doing bad by doing good: Why humanitarian action fails*. Stanford University Press.

Dave, D., Friedson, A., Matsuzawa, K., McNichols, D., and Sabia, J., (2020). Did the Wisconsin Supreme Court restart a Covid-19 epidemic? Evidence from a natural experiment, NBER Working Paper.

Dudley, S., & Mannix, B. (2019). Improving regulatory cost-benefit analysis. *Journal of Law and Politics, 34*(1), 1–20.

Dudley, S., & Peacock, M. (2017). Improving regulatory science: A case study of the national ambient air quality standards. *Supreme Court Economic Review, 24*(1), 49–99.

Eskin, C., Paarporn, K., & Weitz, J. (2019). Systematic biases in disease forecasting—the role of behavior change. *Epidemics, 27*, 96–105.

Gallic, E., Lubrano, M., & Michel, P. (2021). Optimal lockdowns for COVID-19 pandemics: analyzing the efficiency of sanitary policies in Europe. Journal of Public Economic Theory, 1–24.
Goolsbee, A., & Syverson, C. (2020). Fear, lockdown, and diversion: comparing drivers of pandemic economic decline, *Journal of Public Economics*, 193.
Halkias, M. (2020). Albertsons, Tom Thumb, Randalls, Central Market, H-E-B add ‘sneeze guards’ at the registers, Dallas Morning News.
Hardingham-Gill, T. (2020). Qatar Airways cabin crew to wear hazmat suits, CNN.
Harford, T. (2011). *Adapt: Why success always starts with failure*. Farrar, Straus and Giroux.
Isakov, L., Lo, A., & Montazerhodjat, V. (2019). Is the FDA too conservative or too aggressive?: A Bayesian decision analysis of clinical trial design. *Journal of Econometrics, 211*, 117–136.
Jack, R., Halloran, C., Okun, J., and Oster, E. (forthcoming). Pandemic schooling mode and student test scores: evidence from U.S. school districts. *American Economic Review: Insights*.
Jacobson, N. C., Lekkas, D., Price, G., Heinz, M. V., Song, M., O’Malley, A. J., & Barr, P. J. (2020). Flattening the mental health curve: COVID-19 stay-at-home orders are associated with alterations in mental health search behavior in the United States. *JMIR Mental Health, 7*(6), e19347.
Johnston, J. (2012). *Institutions and incentives in regulatory science*. Lexington Books.
Khazan, O. (2020): Grocery stores are the coronavirus tipping point, *The Atlantic*.
Kuhfeld, M., Soland, J., & Lewis, K. (2022). Test score patterns across three COVID-19-impacted school years. *Cornell Hotel and Restaurant Administration Quarterly., 51*, 304–322.
Leeson, P., & Thompson, H. (2021). Public choice and public health, *Public Choice*.
Leeson, P. T., & Rouanet, L. (2021). Externality and COVID-19. *Southern Economic Journal, 87*, 1107–1118.
Luther, W. (2020). Behavioral and policy responses to Covid-19: Evidence from Google mobility data on state-level stay-at-home orders, AIER Sound Money Project Working Paper.
March, R. J. (2021). The FDA and the COVID-19: A political economy perspective. *Southern Economic Journal, 87*, 1210–1228.
Mittiga, R. (2022). Political legitimacy, authoritarianism, and climate change. *American Political Science Review, 116*(3), 998–1011.
Mulligan, C .B. (2020). Deaths of despair and the incidence of excess mortality in 2020, Working Paper 28303, National Bureau of Economic Research.
Ravindran, S., & Shah, M., (2020). Unintended consequences of lockdowns: COVID-19 and the shadow pandemic, Technical Report, National Bureau of Economic Research.
Redford, A., & Dills, A. K. (2021). The political economy of drug and alcohol regulation during the COVID-19 pandemic. *Southern Economic Journal, 87*, 1175–1209.
Smith, A. (1759). *The theory of moral sentiments*. Liberty Fund.
Stigler, G. (1971). The theory of economic regulation. *The Bell Journal of Economics and Management Science., 2*(1), 3–21.
Stigler, G. (1975). The goals of economic policy. *The Journal of Law and Economics., 18*(2), 283–292.
Storr, V. H., Haeffele, S., Lofthouse, J. K., & Grube, L. E. (2021). Essential or not? Knowledge problems and COVID-19 stay-at-home orders. *Southern Economic Journal, 87*, 1229–1249.
Tabarok, A. (2015). Is the FDA Too Conservative or Too Aggressive? *Marginal Revolution*, https://marginalrevolution.com/marginalrevolution/2015/08/is-the-fda-too-conservative-or-too-aggressive.html.
Tollison, R., & Wagner, R. (1991). Self-Interest, public interest, and public health. *Public Choice, 69*, 323–343.
Tullock, G. (1965). *The politics of bureaucracy*. Public Affairs Press.
Wagner, R. (2016). *Politics as a peculiar business: Insights from a theory of entangled political economy*. Edward Elgar Publishing.
Wagner, W. E. (1995). The science charade in toxic risk regulation. *Columbia Law Review, 95*, 1613–1723.
Winsberg, E., Brennan, J., & Surprenant, C. (2020). How government leaders violated their epistemic duties during the SARS-CoV-2 crisis. *Kennedy Institute of Ethics Journal, 30*, 215–242.