# Volume 40, Issue 3

## Should we Hibernate in a Lockdown?

Federico Sturzenegger
*Universidad de San Andres*

## Abstract

Discussion on the optimal response to lockdowns is just starting. In this note, we make a simple yet apparently ignored point. If a lockdown entails a reduction in the desire for consumption, attempts to smooth the income effect of the lockdown lead to welfare losses. The optimal response resembles hibernation whereas it is optimal to lower consumption while the lockdown persists. In a framework with public goods, the result suggests it may also be optimal to reduce non-essential public spending hand in hand with taxes.

# 1   Introduction

Discussion on the optimal policy response to lockdowns grew as fast as the virus spread across the world. Early contributions include Eichenbaum et al. (2020), McKibbin and Fernando (2020), Faria-e Castro (2020), Guerrieri et al. (2020), Acemoglu et al. (2020), Atkeson (2020), Alvarez et al. (2020), Chang and Velasco (2020), Rowthorn and Toxvaerd (2012), Jones et al. (2020), Farboodi et al. (2020) and Garriga et al. (2020), together with a wealth of policy discussion papers, blogs and conference discussions. At a policy level see, for example, the long collection of essays in Baldwin and Mauro (2020), while Hevia and Neumeyer (2020) and Levy (2020) provide a perspective for emerging economies.

In general, the discussion has focused on how to smooth incomes through what was understood was a negative transitory shock. In this paper we want to counterweight this framework, by using a simple observation: utility functions change during a pandemia, leading to changes in the composition of goods consumed, but also reducing the willingness to consume itself. This fact has a significant impact on the policy recommendations. If the desire for consumption falls, bringing future income to today is welfare decreasing. In fact, it may be optimal to transfer income not into but out of this state. The metaphor of hibernations is adequate: during the lockdown it is best to reduce consumption, rather than deplete resources that will be necessary either to survive the lockdown itself or which will be more valuable further down the road.

While this counters most of policy recommendations, it is particularly important for countries searching for fiscal space to finance health related spending and transfers to vulnerable groups. For example, public sector spending associated to goods and services not related to the pandemia have remained mostly constant. The analysis of this brief note suggests that if utility from the consumption of these goods has fallen it may actually be *optimal* to reduce this spending hand in hand with a reduction in taxes. In this way society naturally moves to its lower production-consumption optimal choice.

The distinctive feature of the exercise is that we will assume that during the lockdown, people require less private and public goods to achieve the *same* level of utility. There are several reasons why this may occur. During a lockdown people value their contribution in helping contain the

spread of the disease. So, avoiding consumption (not going to a restaurant, or not visiting friends) provides a compensatory satisfaction that mitigates the impact that those deprivations would usually have had on utility. The change in the desire for consumption may also be the result of fear: I do not want to consume in order to avoid contagion. Finally, there is extensive literature on the role of defaults and consumer present bias. The pandemia provides fertile ground for the mechanisms of these theories to change consumer behaviour: forcing a lockdown is like setting "no consumption" as default, and consumers stick to it. Furthermore, the lockdown can operate as a commitment device to avoid present bias. (See Beshears et al. (2018).)

There is ample empirical evidence of consumer shift in the pandemia. Perhaps the easiest way to see this, is by noticing the sharp increase in savings rates in developed economies. At a more behavioral level EY's consumer survey (EY, 2020) classifies consumer changes in four categories: *cut deep* with 64% of this group only buying essential items, *save and stockpile* who spend more on groceries, and dramatically less on other items such as leisure or clothing, *hibernate and spend*, 40% of which say they are shopping less and finally, *stay calm and carry on*, the least affected group. Regardless of the different patterns, it is clear that consumption habits have changed, at least for a large fraction of the population.

In what follows we develop a simple model that can illustrate this basic intuition.

## 2    The Model

Let us begin assuming an intertemporal utility function that is Leontief in the consumption of private and public goods in each period,

$$U(c_t, g_t) = \int_0^\infty U\left(min(c_t, \frac{g_t}{k})\right) e^{-\rho t} dt. \tag{1}$$

This Leontief specification, which we use just to make the result more intuitive, implies that it is optimal to keep

$$c_t = k g_t \tag{2}$$

where $k > 1$. To make the point as simple as possible, assume initially that the economy can borrow at a constant interest rate $r$ and we assume zero initial debt. The dynamics of debt follows:

$$\dot{b}_t = rb_t + y - g_t - c_t = rb_t + y - c_t(1 + \frac{1}{k}),\tag{3}$$

where $y$ is a constant endowment. The agent chooses simultaneously $c$ and $g$. The optimal conditions of this program are trivially that

$$U_c = \lambda(1 + \frac{1}{k}),\tag{4}$$

and

$$\dot{\lambda} = 0,\tag{5}$$

which means that consumption is constant. Integrating the budget constraint, and assuming the No Ponzi condition holds, the result is that

$$c^* = \frac{y}{(1 + \frac{1}{k})}.\tag{6}$$

Consumption is constant and lower than income because the consumer leaves aside some income for spending in public goods. The amount $g^* = y\frac{\frac{1}{k}}{1+\frac{1}{k}}$ can be understood as the reduction in consumption relative to income to provide for these resources.

## 2.1 Optimal response to a lockdown

We assume that in a lockdown the economy has a transitory reduction in output to $\phi y$, $(\phi < 1)$ but an equivalent reduction in the desire for consumption of private and public services. In short we assume that during the lockdown the utility of consumption and its marginal utility remain the same but at the new *lower* consumption level. The new utility function is

$$U(c_t, g_t) = \int_0^T V(min(c_t, \frac{g_t}{k}))e^{-\rho t}dt + \int_T^\infty U(min(c_t, \frac{g_t}{k}))e^{-\rho t}dt\tag{7}$$

where $T$ is the duration of the lockdown and

$$V(\phi c, \phi \tfrac{g}{k}) = U(c, \tfrac{g}{k}),$$
(8)

$$V_c(\phi c, \phi \tfrac{g}{k}) = U_c(c, \tfrac{g}{k}).$$
(9)

The maximization problem entails first order conditions similar to the problem above. As $\dot{\lambda} = 0$ continues to hold, the FOC indicate that marginal utility has to remain constant over the program. Yet because of (9) this will hold when $c_L$ the consumption during the lockdown, has fallen with output, that is when $c_L = \phi c$. So, by assumption, there is no desire for consumption smoothing, and the economy does not take any debt.

The response is shown in Figure 1. The graph shows the consumption and government expenditures during the lockdown $(c_L, g_L)$ and $(c^*, g^*)$ after the lockdown.

While the result derives trivially from the change in utility, the policy implications result opposite to conventional wisdom. Private and public consumption now scale down, and the private sector sets aside a smaller amount of resources for government services (in practice this would mean, reducing taxes hand in hand with reducing spending in non essential public goods and services).

Rather than attempting to keep the level of government expenditures constant, not to speak of increasing it, here the optimal response is to reduce public spending as well as the taxes need to finance it. The optimal response is akin to hibernation during the lockdown.

Of course this argument leaves aside the potential for more expenditure being needed for health related issues, as well as subsidies or transfers to avoid the destruction of labor relationships during the downturn (see Guerrieri et al., 2020), all valid points but which we do not intend to model here. Furthermore, for the very poor and most vulnerable in societies the above may not be a good representation in the shift in the utility function. If consumers are close to their subsistence level it is difficult to argue that their utility levels will remained unchanged if they consume a fraction of previous consumption. The point we do want to make is that to the extent that utility does change, at least for *some* groups, the standard consumption smoothing argument does not apply.
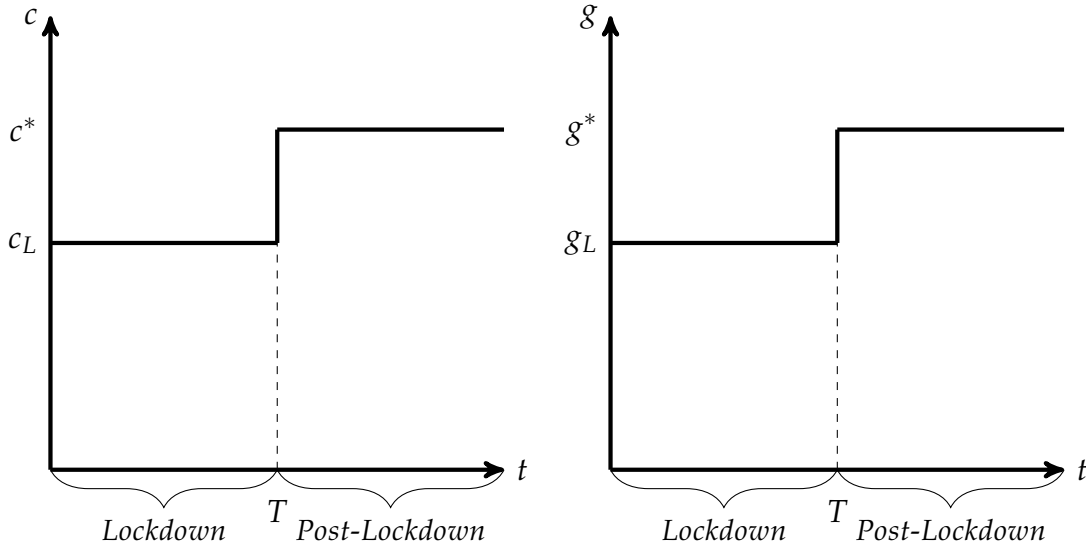
Figure 1: The Lockdown Equilibrium

## 2.2 Constant spending and the role of financing

We now assume that in the lockdown, the government decides to keep government expenditure constant at the original (pre-lockdown) level $g^*$ forcing the consumer to keep buying this amount of public goods. For the consumer this is equivalent to an income loss in the amount of this extra spending, as in this specification additional spending provides no utility. The consumer will choose to smooth this loss over their lifetime. As a result consumption will fall in all periods by

$$r \int_0^T (g^* - g_L)e^{-rt}dt = r(g^* - g_L)\frac{1 - e^{-rT}}{r}, \tag{10}$$

which is the interest cost of financing the extra government expenditure during the lockdown period.

Notice that after the end of the lockdown utility remains forever at a lower level as shown in Figure 2 placing the consumer on a lower consumption level ($c'_L$). The reason for this is that during the lockdown the economy will accumulate debt, that needs to be paid afterwards. In this exercise everything stacks the deck against this being optimal: the change in utility implies that the consumer does not desire to smooth consumption, and the Leontief preferences imply that this extra expenditure in public goods provides no utility. But these extreme assumptions are
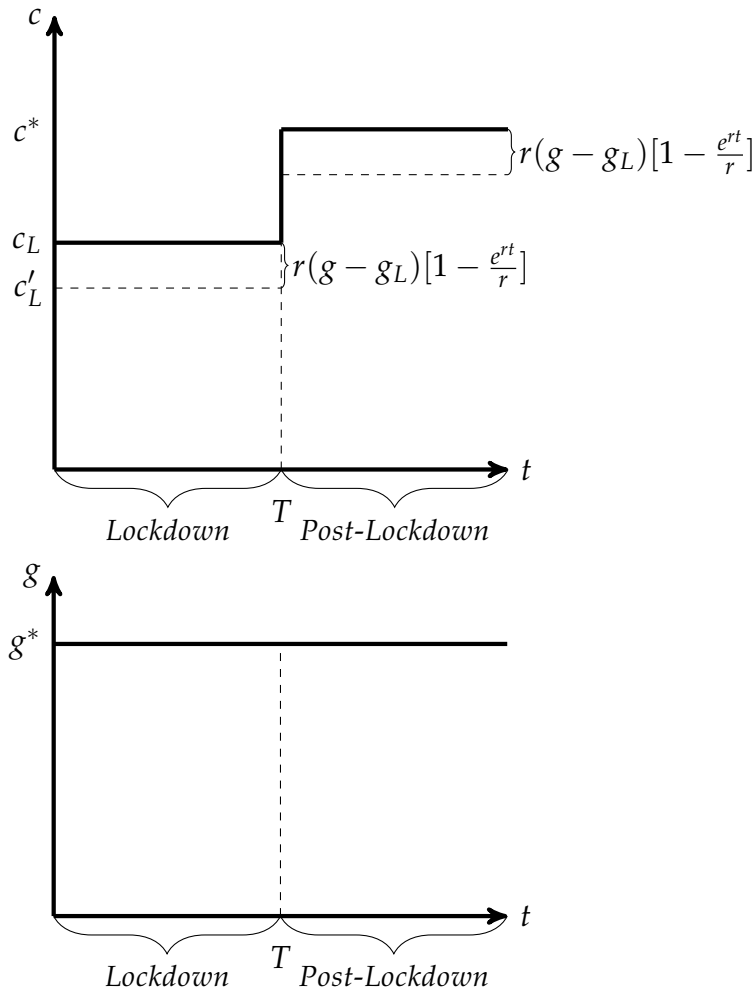
Figure 2: Smoothing the above optimal government expenditure

not necessary for the result. To the extent that government expenditures are pushed above what would derive from an optimal choice, and spending is moved to periods with lower utility, the results will still hold, and result in lower utility.

If there is no access to financing, trivially consumption has to fall, relative to $c_L$ by $g^* - g_L$ (we will call this level $c_L''$). Figure 3 shows the path for private and public consumption. During the lockdown the reduction in private consumption is larger than in the previous case, as the private sector has to finance the constant level of public expenditures fully and at a time of distress, thus pushing its consumption level substantially below its lockdown level. This utility level is trivially below that of the case in which financing is possible.
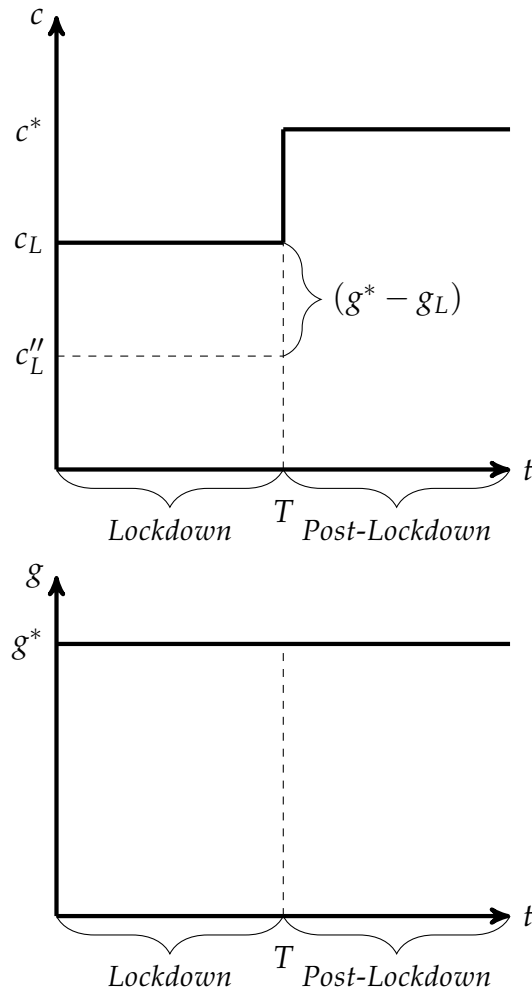
Figure 3: Adjustment with no financing

# 3 Further thoughts

The simple assumption that the utility from consumption may fall during the pandemia, suggests that a downward adjustment in consumption may be the optimal response in the face of lower production and lower utility. In fact, one natural way to verify this hypothesis is by noticing, as mentioned above, the sharp increase in savings rates in developed economies (in the US, for example, the personal savings rate jumped from 7.9% to 32.2% between January and April of this year). In emerging economies the process has also occurred. An example is that in countries with unionized labor markets, such as Argentina, unions and firms agreed to cut nominal wages for activities that were shut down during the pandemia. One interpretation is that with a lower desire for consumption, the cost of foregoing income was smaller and was more than compensated by

the benefit of preserving the jobs. In short they were moving income out of this state to increase it in future periods, as per the intuition presented above. Of course, in emerging economies also a large fraction of the population (eg. informal workers) may have adjusted their consumption out of necessity as their incomes fell.

The model presented here suggests that it is optimal to reduce non essential public spending in order to reduce the tax burden on the private sector, or eventually to create the fiscal space for pandemia related needs. However, the evidence on this is uneven. While many countries have implemented a reduction in public sector wages, Uruguay, Ecuador, India, New Zealand, Paraguay and Burkina Faso, and others have implemented wage freezes such as Australia, Belize and Costa Rica, in most the response has been small if any at all.[1]

This need for fiscal space will become increasingly necessary if the economy hits its financing limit, something quite likely if, as suggested by Cochrane[2], low levels of contagion resulting from self imposed isolation decided by individuals lead to a long survival tail for the pandemia. If public spending does not adjust, financing will eventually have to come from taxes or inflation, which increases even further the burden on the already strained private sector.

Notice, however, that if such a change in utility occurs, the welfare effects of the drastic reductions in income need to be qualified. During lockdowns agents do not produce, but also *do not want* to consume. The economy reverts, albeit transitorily, to a much smaller state, with utility not affected nearly as much as what would occur as a result of an equivalent reduction in consumption in normal times. If this is true, comparing the depth of the economic recession produced by the lockdowns, would not provide a relevant metric in an utility sense.

The example presented here, may also be a useful guide for thinking about a more general response to the unique conditions of a lockdown. During a lockdown the government virtually dictates that some factors of production cannot produce: some labor cannot work, some capital cannot be used, etc. Attempting to keep all contracts unchanged under this scenario is virtually impossible. Take the case of a rent holder: how will they be able to pay the rent if the government doesn't allow them to produce in order to pay the rent? It appears that a more even distribution

---

[1]See IMF (2020), for a survey of these cases.
[2]https://johnhcochrane.blogspot.com/2020/05/an-sir-model-with-behavior.html

of costs can be obtained by a more careful definition of property rights during a lockdown.

With a short lockdown these issues may be smoothed away individually, but with long lock-outs this may become a pressing issue. Of course we do not model this decision here, but our hibernation concept becomes handy. If the lockdown applies more evenly to all factors of production, it may require that all contracts should "hibernate" during the lockdown, very much as the consumption in the exercise of this paper. Property should not earn rent, bonds should not accrue interest, deposits will not earn and loans will not pay interest, etc, very much as workers will not collect wages, or the government will not collect taxes.

Of course, the practical challenges of implementation may be daunting. In the example above it may sound reasonable to implement a rent standstill for a worker that cannot work, but the same argument does not carry to those workers that are able to continue working. The issue has been brought up, however, in the context of sovereign debt where a debt standstill has been proposed (see, Bolton et al. (2020)).

In other words a debate may be necessary regarding whether, when a government issues a general standstill of production, it should decide on a concomitant standstill in contracts for all those precluded from producing during this period. It seems that failing to do so may lead to substantial financial and contractual distress. Again, the idea of a hibernation could be relevant for a wider range of issues than those discussed here, but this is an area that needs further research.

# References

Acemoglu, D., Chernozhukov, V., Werning, I., and Whinston, M. D. (2020). "A Multi-Risk SIR Model with Optimally Targeted Lockdown". Working Paper 27102, National Bureau of Economic Research.

Alvarez, F. E., Argente, D., and Lippi, F. (2020). "A Simple Planning Problem for COVID-19 Lockdown". Working Paper 26981, National Bureau of Economic Research.

Atkeson, A. (2020). "How Deadly Is COVID-19? Understanding The Difficulties With Estimation Of Its Fatality Rate". Working Paper 26965, National Bureau of Economic Research.

Baldwin, R. and Mauro, B. W. d. (2020). *Economics in the Time of COVID-19*. CEPR Press.

Beshears, J., Choi, J. J., Laibson, D., and Madrian, B. C. (2018). "Behavioral household finance". In *Handbook of Behavioral Economics: Applications and Foundations 1*, volume 1, pages 177–276. Elsevier.

Bolton, P., Buchheit, L. C., Gourinchas, P.-O., Gulati, G. M., Hsieh, C.-T., Panizza, U., and Weder di Mauro, B. (2020). "Born Out of Necessity: A Debt Standstill for COVID-19". Technical report, Center for Economic Policy Research; Policy Insight No. 103.

Chang, R. and Velasco, A. (2020). "Economic Policy Incentives to Preserve Lives and Livelihoods". Working Paper 27020, National Bureau of Economic Research.

Eichenbaum, M. S., Rebelo, S., and Trabandt, M. (2020). "The macroeconomics of epidemics". Technical report, National Bureau of Economic Research.

Farboodi, M., Jarosch, G., and Shimer, R. (2020). "Internal and External Effects of Social Distancing in a Pandemic". (27059).

Faria-e Castro, M. (2020). "Fiscal policy during a pandemic". *FRB St. Louis Working Paper*, (2020-006).

Garriga, C., Manuelli, R., and Sanghi, S. (April 2020). "Optimal Management of an Epidemic: An Application to COVID-19. A Progress Report". Technical report, mimeo.

Guerrieri, V., Lorenzoni, G., Straub, L., and Werning, I. (2020). "Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages?". Working Paper 26918, National Bureau of Economic Research.

Hevia, C. and Neumeyer, A. (2020). "A Conceptual Framework for Analyzing the Economic Impact of COVID-19 and its Policy Implications". UNDP LAC C19 PDS No. 1, UNDP Latin America and the Caribbean.

IMF (2020). "Special series on Covid Issues. When cutting government pay to help reshuffle spending in a crisis". Technical report, IMF.

Jones, C. J., Philippon, T., and Venkateswaran, V. (2020). "Optimal mitigation policies in a pandemic: Social distancing and working from home". Technical report, National Bureau of Economic Research.

Levy, S. (2020). "Suggestions for the emergency". UNDP LAC C19 PDS No. 2, UNDP Latin America and the Caribbean.

McKibbin, W. J. and Fernando, R. (2020). "The global macroeconomic impacts of COVID-19: Seven scenarios".

Rowthorn, B. R. and Toxvaerd, F. (2012). "The optimal control of infectious diseases via prevention and treatment". Technical report, CEPR Discussion Paper No. DP8925.