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A Note on Hibernation in a Lockdown

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Abstract

Discussion on the optimal fiscal 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 the optimal response is to reduce consumption, a response that I call "hibernation". In this case, attempts to smooth the effect of the lockdown, which has been the almost universal recommendation to deal with Covid-19, leads to welfare losses.

*I thank Constantino Hevia, Santiago Mosquera and Andres Neumeyer for useful comments. Correspondence address: fsturzenegger@udesa.edu.ar

1 Introduction

Discussion on the optimal fiscal response to lockdowns is just starting (Eichenbaum et al. (2020), McKibbin and Fernando (2020), Faria-e Castro et al. (2020), Hevia and Neumeyer (2020), Levy (2020), Guerrieri et al. (2020) and a wealth of policy discussion papers). In this note, we refer to a "lockdown" as an imposed requirement on social distancing that halts most economic activity during a certain period of time, producing unheard off declines in output. Hand in hand with this decline, fiscal resources also collapse, at a time that fiscal demands in health related spending and income protection for the most vulnerable increases.

The distinctive feature of the exercise in this note is that We model this social distancing directive as a change in the utility function for private and public consumption. 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 deprivation would usually have had on utility (we could call this a solidarity effect). It may simply be the fact that the pandemics changes habits and, thus, preferences.

Notice that if we accept such a change in utility during the pandemics, this qualifies our assessment of the welfare effects of the drastic reductions in income that will be observed. 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.

It is easy to see that, if the desire for consumption decreases during the lockdwon, the optimal response is to reduce consumption of both private and NPR (not pandemic related) public goods, reverting to a state which we can call "hibernation".

While during lockdowns this adjustment occurs almost automatically in the private sector (self employed individuals experience a reduction in their income and spending, companies have announced reductions in wages during the pandemia, and so on); when applied to the public sector, the statement has policy implications that are basically opposite to conventional wisdom on the pandemics, as it is typically agreed that government expenditure has to smooth expenditure during the transitory negative shock, if not compensate the demand downfall. If the desire for consumption falls, the optimal response entails reducing expenditure pari passu with the reduction in income. And while many countries have implemented such response (Uruguay, Ecuador, India, New Zealand, some subnational governments in Argentina, among others) this is not the typical recommendation.

We show that paying heed to this will entail a welfare loss because the resources used when consumers do not want to consume will then have to be financed when consumers do want to consume. To make the point extreme, we model this as a Leontief utility function. In that case it is easy to see that all extra spending in public goods during the lockdown delivers no utility and is pure waste. This assumption is not necessary but helps to show the result.

This welfare loss may be larger for governments with no access to financing, and thus unable to smooth over time the deficit produced by the fall in revenues. If no financing is available the spending will need to be financed from extracting resources from the already stressed lower production level (through increased taxes or inflationary financing). [1]

In short, failing to bring government spending to its (lower) optimal level, implies paying for public goods that are not being produced, to recipients that are not willing to spend, at a time when transferring resources to the needy, particularly those in the informal sector, becomes critical.

[1] It may be argued that during the lockdown the increase in money supply will not produce inflation due to the increase in money demand, which can be later absorbed once situations normalize. In this case money printing becomes a transitory means of reaching the moment when intertemporal financing is possible.

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,

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

We show the preferences at each point in Figure 1. This specification assumes that pandemic related expenditures are separable. This Leontief specification implies that it is optimal to keep

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

where $k > 1$

To make the point as clear as possible, we assume the economy can borrow at a constant interest rate r and we assume zero initial debt. The dynamics of debt follows:

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

where y is a constant endowment. The agent chooses simultaneously c and g thus the choice of consumption entails a simultaneous use of the public good. 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 lower than income because the consumer leaves aside some income for spending in public goods. The amount $\frac{c}{k}$ can be understood as the reduction in consumption relative to income to provide for these resources.

In short consumption, output and government expenditures are constant in every period at c^* and g^* as in Figure 1. Output is split between spending in private and non pandemic related public goods and no debt is issued.

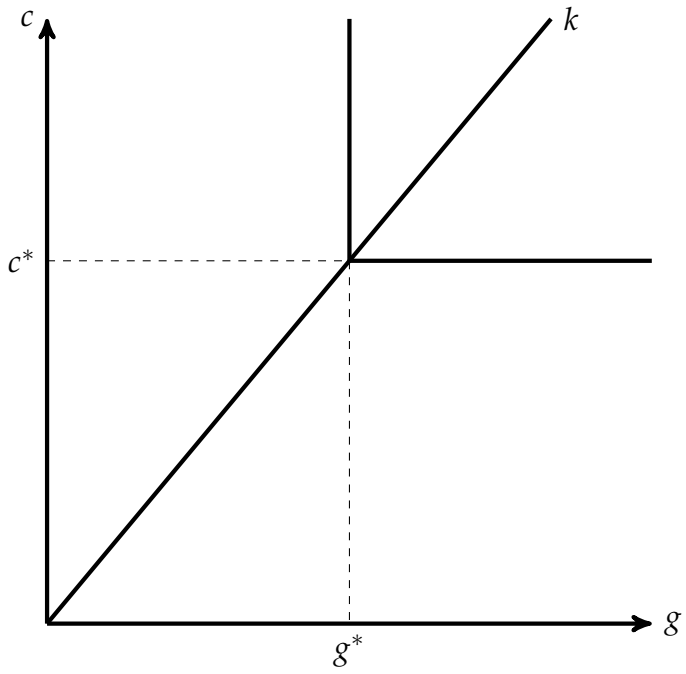

Figure 1: Steady State Consumption

2.1 The lockdown

We now assume very special conditions for the lockdown. These very specific assumptions are not necessary for the argument but allow to make the point more clearly.

We assume that in a lockdown the economy has a transitory reduction in output to ϕy, $(\phi < 1)$ but, and this is the key, 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 even 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

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

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

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 **??** 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 consumption smoothing, and the economy does not take any debt.

The response is shown in Figure 2. The graph shows the consumption and government expenditures during the lockdown (c_L, g_L) and (c^*, g^*) after the lockdown.

Of course we assume this change in utility. But we believe it is an essential piece in our understanding of the necessary response to the pandemia. Ignoring this, implies ignoring the change in the desire to consume during the lockdowns.

While the assumption of the change in utility is essential, and a key ingredient of what we are arguing here, the very specific change in the utility function is just chosen to simplify the

results. In our very special case everything scales down during the lockdown. And while the assumptions that lead to the result are easily understood, the policy implications result opposite to conventional wisdom. In particular government services scale down: the private sector sets aside a smaller amount of resources for government services (in practice this would mean, for example, reducing taxes and spending in non essential public goods and services, for example paying only partially the salaries and/or transfers during the lockdown). 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.

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, valid points which are not modelled here.

Transfers to the very poor and most vulnerable in societies may also not be well represented by the shift in the utility function above. If consumers are close of 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 argument does not apply and has to be adjusted to take into account the change.

Also trivially, in this setup, attempts to keep government expenditure constant during the pandemia clearly will be detrimental to welfare, relative to what has been described in this section. We discuss next by how much. The welfare cost, of course, will depend on the ability of the society to smooth this excess spending over time.

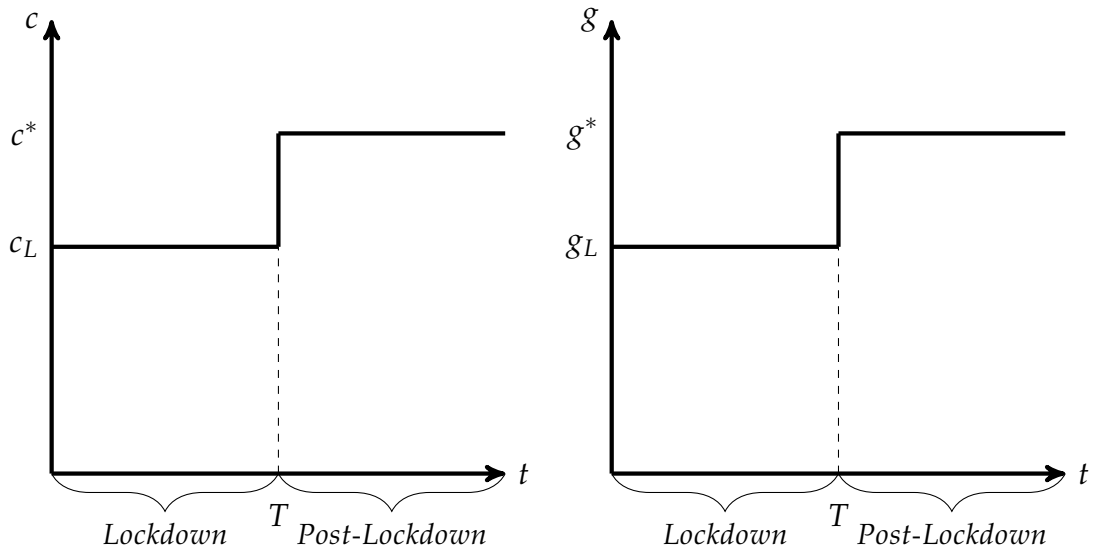

Figure 2: The Lockdown Equilibrium

2.2 Constant government expenditure with debt 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 just like an income loss equivalent to this extra spending as in this specification additional spending provides no utility. The dynamics of debt follow now

$$\dot{b}_t = rb_t + y_t - c_t - g^*, \tag{10}$$

where g^* is exogenous. The consumer will choose to smooth this loss over their lifetime. As a result consumption will fall in all periods by

$$r\int_0^T (g^* - g_L)e^{-rt}dt = r(g^* - g_L)\frac{1 - e^{-rT}}{r} \tag{11}$$

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

period.

During the lockdown the economy will accumulate debt, that will 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 assumption are 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.

In this specification the result is made clearest because government services provide no utility, but need to be financed, which reduces private income and consumption. With access to capital markets the economy borrows to smooth this over time. But notice that after the end of the lockdown utility remains forever at a lower level as shown in Figure 3 placing the consumer on a lower consumption level (C_L') and therefore with lower utility. In all cases the welfare cost will also be directly related to the extent of the lockdown.

2.3 Constant government expenditure without financing

The case above showed the effects of financing an excessive government expenditure during the lockdown when the economy can smooth the cost of financing this expenditure. The private sector finances a temporary transfer to the public sector, but its welfare cost is reduced by the possibility of smoothing it out over time.

But what would be the situation if a government did not have access to financing? In this case, trivially consumption has to fall, relative to c_L by $g^* - g_L$ (we will call this level c_L''.

Figure 4 shows the path for private and public consumption. During the lockdown the reduction in private consumption is larger in the previous case, as the private sector has to finance the constant level of public exenditures fully and at a time of distress, thus pushing its

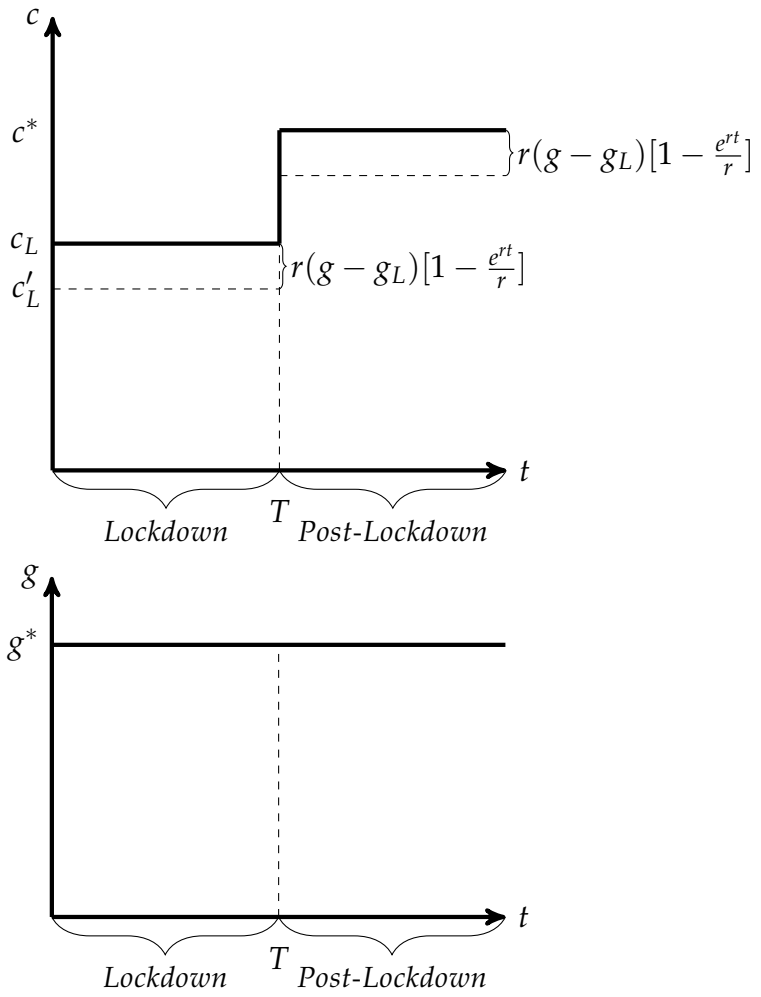

Figure 3: Smoothing the above optimal government expenditure

consumption level substantially below its lockdown level.

An economy that decides to continue financing pre-lockdown levels of government expenditure, may do so by increasing taxes or resorting to the inflation tax (money printing). Given that the inflation tax hurts the poorest, in a context of heterogeneous agents, this option may lead to extreme poverty and extremely negative utility levels in most vulnerable groups, and seems to be the worst possible scenario. In fact these groups are among those that probably need most help in the transition, thus the resources from public services not demanded should be diverted to this groups and to health initiatives.

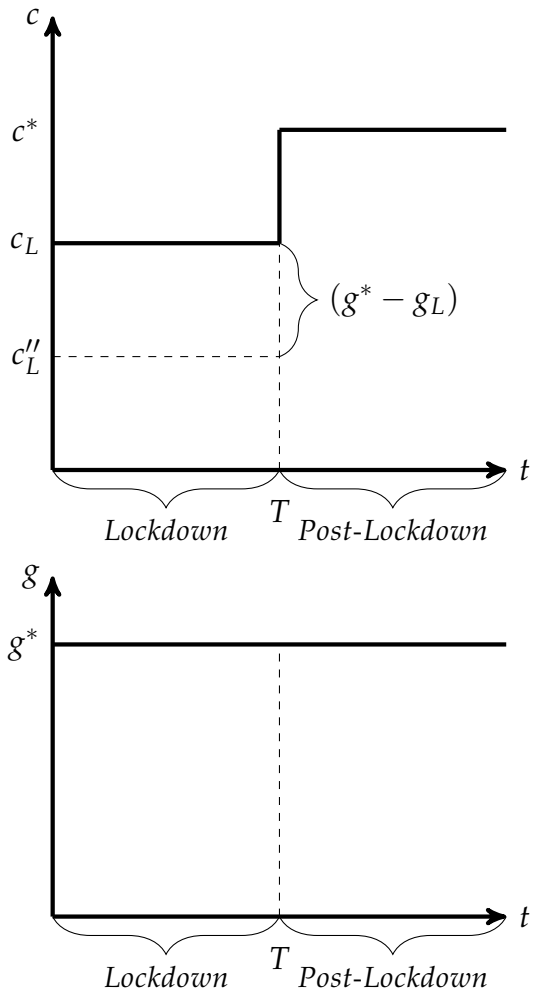

Figure 4: Caption

3 Further thoughts

The example presented here, and the idea that during a lockdown the optimal response (at least to some extent) may be an hibernation state of lower activity, may be a useful guide for thinking about the general response to the unique conditions of a lockdown. During a lockdown the government virtually dictates that factors of production cannot produce: labor cannot work, 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? This begs another question. Does the lockdown apply to labor or both to labor and capital? If the lockdown applies to capital as well, it would imply that no rent accrues during the lockdown. Of course, With a short lockdown these issues may be smoothed away individually, but with long lockouts this is not a tenable proposition. It is here that our example may come in handy. If the lockdown applies more evenly to all factors of production, it may require that all contracts should "hibernate" during the lockdown. 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 that will not collect wages, or the government that will not collect taxes. In other words if the government issues a general standstill of production this should imply a concomitant standstill in contracts whose viability depends on the possibility of producing during this period. Failing to do so may lead to substantial financial and contractual distress. Again, the idea of a hybernation could be relevant for a wider range of issues than those discussed here.

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