The macroeconomics of covid-19

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Growth and Distribution

Many of you expressed an interest in how covid-19 is likely to affect the economy so I've written up this short lecture connecting some ideas I have had to the material in this course. It is meant to be read with the text handy as it refers to figures from G&D.

In the first place, we need to specify exactly what the question is since the effects of this pandemic are manifold. I propose to treat it as a one-time shock that acts like a form of technical *regress*. It is as if a large chunk of the capital stock has been wiped out (possibly reducing labor productivity as well, but let's set that aside). This is a well-defined question, and we can interrogate the growth models we've developed to get some answers, or to be more precise, some insights. We could make this more complicated by considering changes in labor productivity, either one-time shocks or permanent reductions in the rate of technical change, but its best to keep it simple.

My first choice would be the Keynesian growth model from Ch. 12. The immediate effect of the pandemic has been a massive collapse of spending, in particular investment spending. The investment-constrained model suggests this will lead to a large decline in utilization, even taking into account the loss of capital stock. We would represent that by an inward rotation of the G&D schedule around a fixed vertical intercept on the w-axis.[1] If it doesn't have a large effect on the wage share, we know that it must cause a decline in the rate of profit. This is what the financial markets also know, and that is why the stock markets have collapsed, and are now fluctuating on every bit of news about possible monetary and especially fiscal responses that might put a floor on the recession. The text model abstracts from government spending and taxing, but it does not take much to add them in to see how Keynesian policies work to restore demand.

We can add to that story by consulting the augmented Keynesian model with a distributive curve in section 12.9. The demand shock would shift the aggregate demand curve leftward in a figure like Figure 12.8. The decline in utilization would reduce workers' bargaining power and increase the profit

[1] The text considers only "Solow-neutral" effects that preserve the productivity of labor, x, but here we might want to consider something more Hicks-neutral so that the vertical intercept also goes down. But as I said, lets keep it simple.

share, so the profit rate wouldn't fall as much. This is a theme we will return to below. This shock may well lead to a more unequal distribution of income. Since we have seen that the wage share has fallen over the last two decades, this would only add insult to injury.

The Keynesian model does a good job of capturing the short-run effects. Its status as a long-run model is controversial. One interpretation is that the policy makers can eventually restore the system to full or normal utilization. For example, the monetary authority can pump liquidity into the banking system and create favorable conditions for an investment-led recovery. Fiscal policy can also help. Many economists think that we are at the Effective Lower Bound on interest rates, and it will require unprecedented doses of fiscal policy to get recoveries going under conditions of secular staganation. I personally believe we are going to enter an era of renewed reliance on state (i.e., government) intervention, management, and perhaps direct involvement through public investment. The other big unknown here is how well the public health systems will respond, by for example developing and implementing vaccines that let this virus be managed as we do the influenza virus.

Let us assume that economic and public health policy works and the global economy returns to normal utilization. To understand the long run effects of the shock, we need to turn to the classical and neoclassical growth models.

My first choice would be the classical conventional wage share model. In that model, the loss of capital stock (premature obsolescence) would reduce the scale of the whole economy: less output, less employment, etc. If the shock does not lower labor productivity permanently, we should expect to see growth resume at the old rate once the recovery is over. But there is an important point. The loss of the capital stock means that the shock has a "level effect" on the path of the log of the capital stock, shifting it down without changing its slope.

Here is our first important insight: *We will have a permanently lower level of capital as a result of the covid shock and that means permanently lower employment and output.*

There is nothing in this model that makes the aggregates (capital, employment, output) return to the original path. The L-shaped pattern we saw after the Global Financial Crisis will repeat itself (see Figure 12.1). We will not have the V-shaped pattern typical of garden-variety recessions. To get more detailed, the labor force will probably shrink as a share of the population as people see little reason to participate if the jobs just aren't there. We

can also expect immigration to slow down so the population itself responds (this happened to Mexican immigration after the GFC).

The classical conventional wage share model is often criticized because it assumes that the available labor force places no constraints on growth. I think that the insight we have gotten from it is important despite this, as it carries over into other models, even those that include some kind of employment constraint on growth.

It does not carry over to the classical full employment model. That model assumes distribution always adjusts instantly to ensure that a given labor force will be fully employed. The loss of capital stock would make that impossible.

However, the Goodwin model, a close cousin of the classical full employment model, does allow for unemployment–in fact, it more or less requires it! (Unemployment keeps workers weak enough to accept a wage share less than one.) In that model, the loss of capital stock would reduce the employment rate and put the system in the expansion phase of the Goodwin cycle, well to the left on a wage share-employment diagram like Figure 6.8. This means the wage share would decline a lot, and the profit share would increase (which is what causes the expansion to occur). We would expect to see a very strong profit-led recovery, with growth exceeding historical rates for some time. At least until the Goodwin cycle reaches its peak and workers are able to win back income and cause a turnaround in growth.

(Reminder: the employment rate is the ratio between employed workers and the labor supply, $e = N/N^s$.)

This is the second insight (which we already showed in the short run with the Keynesian model). *The shock will lower the employment rate and put workers in a weaker bargaining position. That will favor capital and capitalist profit income. These effects would be "temporary" in the Goodwin model.*

The Goodwin model orbits around a steady state position that is almost identical to the classical full employment model. (Replace full employment with the steady state employment rate and they are virtually identical.) So it predicts that as long as there is no permanent reduction in the growth of output per worker, the system will resume growth at the original rate. It also predicts that since the steady state employment rate is unchanged, the capital stock will eventually catch up to its original path. In other words, we won't see permanently lower employment and output on average.

We might (here I am speculating about the math based on my intuition)

see more extreme swings in the Goodwin cycle, so the recessions could be deeper and the booms boomier. In continuous time models, a Goodwin cycle is an orbit (aka a center) in which you literally return to the point of origin so a shock like this will move us out to a wider orbit (think Jupiter versus Earth). In the Goodwin model with induced technical change in Chapter 7, the cycles eventually peter out so this increased volatility would die down in the long run when, as Keynes said, we are all dead.

I'm skeptical about all this. The Goodwin model is mathematically elegant and economically persuasive. But it also makes some strong assumptions. Empirically, there does appear to be a Goodwin cycle, but studies have shown that it is not located in the same general area in the wage-share, employment rate space (see Figure 6.9 for example) over many decades. It has wandered around quite a bit. I do not think there is *one unique equilibrium employment rate*. Instead, there are multiple possible equilibrium employment rates. Models that have multiple equilibria are often described as being *path dependent*. I'll come back to this.

The Solow model offers another angle, and it is the most optimistic. This is a full employment model that assumes wages are flexible enough to incentivize firms to offer as many jobs are there are workers. In this case, the capital-labor ratio ratio would fall as result of the shock. To get the jobs to match the existing workforce, the wage would have to fall to incentivize firms to use more labor intensive techniques. Maybe we'll go back to gas station attendants pumping gas? At any rate, we can visualize this using Figure 10.3 or Figure 11.2. The shock will knock us out of a steady state to a position below the steady state, like k_0 on the Figures. We know that since saving per worker now exceeds required saving per worker, there will be a transitional period of capital deepening that brings us back to the original equilibrium. Not only will we maintain full employment continuously, but when we arrive back there, we will have the same amount of capital per worker, same output per worker, same living standards, same everything!

The Solow model forms the basis for so much policy advice that I'm inclined to editorialize: the insight here is that policymakers will be drawn toward unwarranted optimism. The classical idea that there could be permanent shocks to employment and output, and/or that there could be further tendency to increase the share of profit (income inequality is already an object of concern), need to be front and center. As Joan Robinson said, the reason to study economics is to avoid being confused by economists.

Let me add some speculative comments that reflect the research I've been

doing with Daniele Tavani. We are working on a kind of generalization of the G&D approach that combines elements of several chapters. We do not have a complete paper yet but the outlines are clear.

First, we accept the Cambridge equation and most of the basic accounting. But we have departed from the assumption of the Goodwin model that there is a unique steady state employment rate. Instead, we think there is a range of possibilities. A simple way to model this is through a linear equation (which could be a linearization of a more complicated nonlinear relationship):

$$\pi = \bar{\pi} - \mu e.$$

This reflects the Goodwinian idea that as the employment rate increases, workers achieve more bargaining power and a bigger share of income.

We have also "endogenized" the rate of population growth, n, but for simplicity let us stick to the text and treat it as parametric. So this is a model like the classical full employment model with a fixed rate of growth of the labor supply, but it does not have a unique fixed employment rate.

Second, we propose the following equation to describe labor-saving technical change:

$$\gamma = \gamma_0 + \gamma_1 \hat{\kappa} - \gamma_2 \pi \qquad 0 < \gamma_1 < 1$$

where κ is the capital-population ratio, K/N^s, and the hat notation denotes a growth rate. The Greek letter *kappa* is a novel variable in a growth model and we are drawing on a recent paper by Lance Taylor, Duncan Foley, and Armon Rezai.

This equation combines the two theories of technical change described in Chapter 9: increasing returns to scale or the Kaldor-Verdoorn Law and distribution-induced research and development. The γ_1 term captures increasing returns, as a result of increasing the scale of the economy as measured by κ. (This is where TFR's paper comes in.) The γ_2 term captures endogenous technical change, sensitive to the profit share. The γ_0 term is autonomous technical change.

We model capital-saving/using technical change with an equation like:

$$\chi = -a\Delta e$$

where Δ indicates "change in" and a is just a parameter. This is loosely inspired by the models of induced technical change in Chapter 7. When there

is an increase in the employment rate, labor markets are tight and firms are anxious to save labor, even if it means choosing more mechanized techniques that lower capital productivity ($\chi < 0$). So in this case we get the kind of Marx-biased technical change we studied in Chapter 8. In the converse case, however, we get capital-saving technical change. So this might explain why we do observe both kinds of biased technical change in the historical record.

This hypothesis makes the bias of technical change a stabilizing force. There is actually some similarity here with the way the Solow model is stabilized, by capital deepening when it is below its steady state, for example.

This model lies in between the conventional wage share and full employment models, which are basically limiting cases. It does not have a unique equilibrium employment rate or a unique profit share. Significantly, it has a steady state growth rate, $g = \gamma + n$, but this is endogenous since the rate of technical change depends on distribution (the profit share).

A big shock that lowers the employment rate by wiping out a chunk of the capital stock will have permanent effects. The model does predict a recovery period. The low employment rate will increase the profit share, and that stimulates accumulation through the Cambridge equation. But an increased profit share makes investing in labor-saving technical change less attractive and slows down the rate of labor-saving technical change. As a result, the growth rate will eventually be lower than it was originally. The period of high accumulation will not last. Moreover, when the system fully adjusts, the employment rate will never recover its original level. It will only recover part way during the period of high accumulation.

In econ jargon, this model is path dependent. There are many possible steady state employment rates. The shock pushes the system to a lower employment rate. But since technical change depends on distribution, and since lower employment raises the profit share, there will be lower growth permanently after the shock. This is a form of wage-led growth–productivity growth is wage-led.

I believe this is of paramount importance. The model does not include mechanisms like fiscal policy or monetary policy, but it does point toward some kind of policy intervention to prevent reverse the damages from the shock of covid-19. We should not have to live with permanently lower employment, lower productivity growth, and an even more unequal distribution of income. There is much policy can do here to limit or reverse the damage, in particular to increase the rate of saving out of profits, but that is beyond the scope of one lecture.

If you've connected the dots, you realize that the news is not good for people entering the labor force post-covid and I'm sure that is a source of anxiety. But if we understand the challenges, we can rise to the occasion and make a difference. To do that, we have to understand the problem. That is why you are studying economics. There is nothing mechanical or predetermined in economics. The bargaining power of workers (including highly skilled workers) can change because of political and social pressure. It is possible that this crisis will speed up the development of a more democratic variety of capitalism.

Discussion question

What do you think policy makers should be planning as a long-run response once the immediate health crisis and recession has ended?