The Tortoise and the Hare: The Race Between Vaccine Rollout and New COVID Variants

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Variants of the virus causing COVID-19, notably the so-called ‘UK variant’, account for a large part of the resurgence of infections in many OECD countries since the latter part of 2020. Seasonal effects also drive fluctuations in virus incidence. More recently, vaccination has been very effective at curbing COVID-19 infections, substituting for lockdown policies at much lower costs to the economy. Those are among the main findings of a recent Economics Department Working Paper – The Tortoise and the Hare: The Race Between Vaccine Rollout and New COVID Variants – an update to a previous version of the study published last year.

The study relates country-level daily reproduction numbers for OECD countries to several potential explanatory factors, including containment policies, public-health policies, seasonal conditions, the prevalence of variants, vaccination rates as well as proxies for spontaneous behavioural changes and natural immunity, all at once within the same framework.

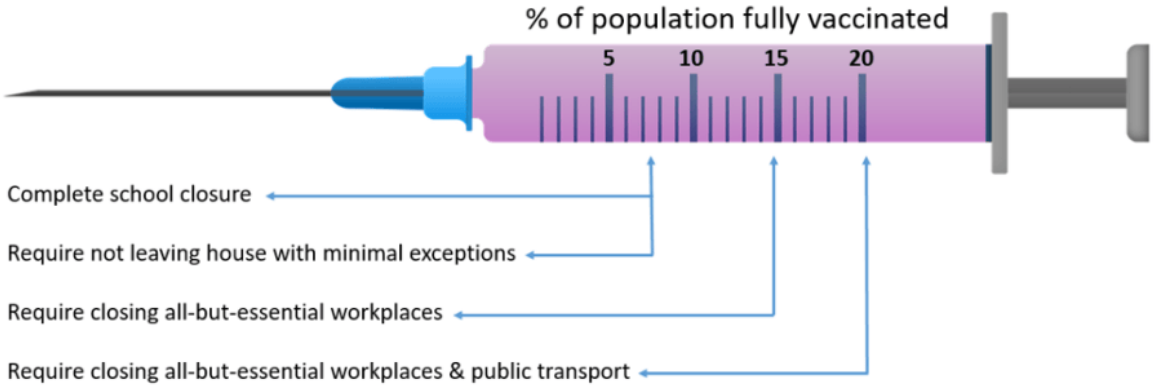
It also relates containment policies to the OECD weekly GDP tracker to study their effects on economic activity.

Some new variants of the virus are estimated to be able to boost the effective reproduction number by up to 50%. Seasonal effects are also found to increase the effective reproduction number in fall/winter, in some countries by up to 25% relative to summer. The rapidity of these adverse shocks represent a major challenge to policy-makers because they can coincide and take full effect over a matter of a few months. The two effects together can potentially boost reproduction numbers by up to 90%.

Thankfully, vaccination is found to powerfully reduce the spread of the virus. The estimated effects can be stated in intervention-equivalent terms (see figure). Fully vaccinating…

- 7% of the population is equivalent to either complete school closure, requiring people not to leave the house with minimal exceptions, or banning all public gatherings;
- 15% of the population is equivalent to closing down all-but-essential workplaces;
- 20% of the population is equivalent to closing down all-but-essential workplaces as well as public transport;
- 50% of the population is equivalent to simultaneously applying all of the above restrictions as well as closing all international borders.

Equivalency between estimated effects of selected containment policies and percentage of population fully vaccinated



And, of course, vaccination does not have the damaging effects on economic activity that lockdown policies have, rather it boosts activity by enabling lockdown policies to be eased. The study's results are used to examine a few scenarios that differ in the presence of COVID variants and the speed of vaccination.

In a baseline scenario without variants nor vaccines, stringent containment policies are needed to keep the reproduction number below 1, and the situation is nevertheless precarious in that many factors, including seasonal influences, have the potential to push the reproduction number above 1 and so lead to a surge in infections.

Another scenario assumes that the UK variant becomes predominant, leading to an increase in transmissibility of the virus by 35%. It shows that with only 13% of the population fully vaccinated (which corresponds to the OECD median in mid-May), the reproduction number remains above 1. Policy-makers then face difficult choices about which containment policies to tighten further. For instance, schools might need to remain closed full time, which would be just sufficient to keep the reproduction number below 1.

A more optimistic scenario illustrates how quick vaccine rollout not only avoids the need to tighten containment polices despite the presence of the UK variant, but enables those in place to be progressively relaxed. For example, with

40% of the population fully vaccinated (which is close to the shares in the United States and United Kingdom at end-May), there is no need for any stay-at-home requirements or workplace closure and restrictions on gatherings can start to be relaxed, which has the added benefit of raising GDP by 4% relative to the baseline scenario.

Together, the scenarios suggest that a rapid rollout of vaccinations is needed to compensate for the pressure from more infectious variants and avoid a cycle of stop-and-go mitigation policies. For those countries now going into summer, it is also important that policy-makers are not lulled into a false sense of security by the temporary decline in reproduction numbers due to seasonal factors, as in the summer of 2020. Failure to vaccinate a sufficient share of the population could then lead to a resurgence of the virus in the winter as seasonal factors reverse.

Further reading

Turner, D., B. Égert, Y. Guillemette and J. Botev (2021), "The Tortoise and the Hare: The Race Between Vaccine Rollout and New COVID Variants", *OECD Economics Department Working Papers*, No. 1672, Paris, OECD Publishing.