COVID-19 Pandexit and the effects on economic activity

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Introduction

Chile's vaccination campaign is progressing rapidly, raising a natural question: **when can we expect mobility—and economic activity—to return to normal?** The answer depends not only on how quickly the population is vaccinated, but also on how effective the vaccines are at preventing contagion.

Using the methodology proposed by Rungcharoenkitkul (2021), we project the evolution of the pandemic and the associated optimal mobility response under a vaccination process similar to Chile's. We consider three scenarios in which vaccines prevent contagion 95%, 60%, and 5% of the time. The exercise allows us to ask how vaccine efficacy affects the expected timing of the return to normality—and what a slower *pandexit* could cost in terms of economic activity.

Figure 4 shows a sizable difference across scenarios. **With 95% efficacy, mobility returns to normal roughly a month and a half earlier than with 60% efficacy.** Over the following six months, the average mobility gap between the two scenarios is approximately 4.7%.

That delay has an economic cost. We estimate that a 10% reduction in mobility is associated with GDP growth that is roughly 1.7 to 3 percentage points lower. Combining this estimate with the projected mobility paths suggests that **a slower return to normality could subtract around 0.4 to 0.6 percentage points from annual GDP growth**. For an economy expected to grow 8.5% under the 60%-efficacy scenario, this implies growth could instead reach roughly 8.9% to 9.1% if vaccines prevented contagion 95% of the time.

The effectiveness of vaccination therefore matters for more than the evolution of the pandemic. **It also determines how quickly we can return to normal—and how much economic activity we lose while we wait.**

Epidemiological model, mobility, and activity

The mechanism is a feedback loop: **mobility supports economic activity, but also creates opportunities for infection**. Rising health risks make restrictions more attractive. Effective vaccination reduces the susceptible population, allowing mobility to recover with a smaller health cost.

The framework follows the 12-compartment model of Rungcharoenkitkul (2021). People move from susceptible to exposed and then infectious. They subsequently isolate at home, enter quarantine, or go to hospital, before recovering or dying. The six isolated groups distinguish these three settings and the two eventual outcomes; only the infectious group transmits in the model. Vaccination provides a route from susceptibility to immunity without passing through infection.

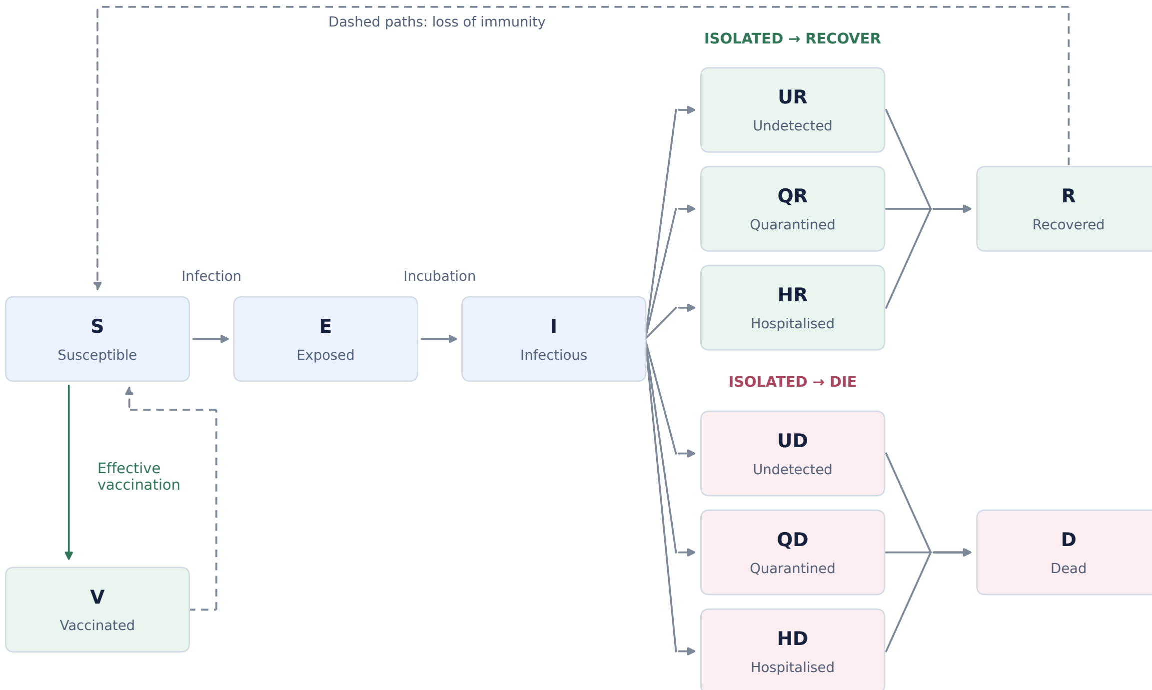


Figure 1: Population flows in the twelve-compartment model.

Population flows in the model. Dashed arrows allow for loss of immunity; the six isolated groups do not transmit. UR, QR, and HR eventually recover; UD, QD, and HD eventually die.

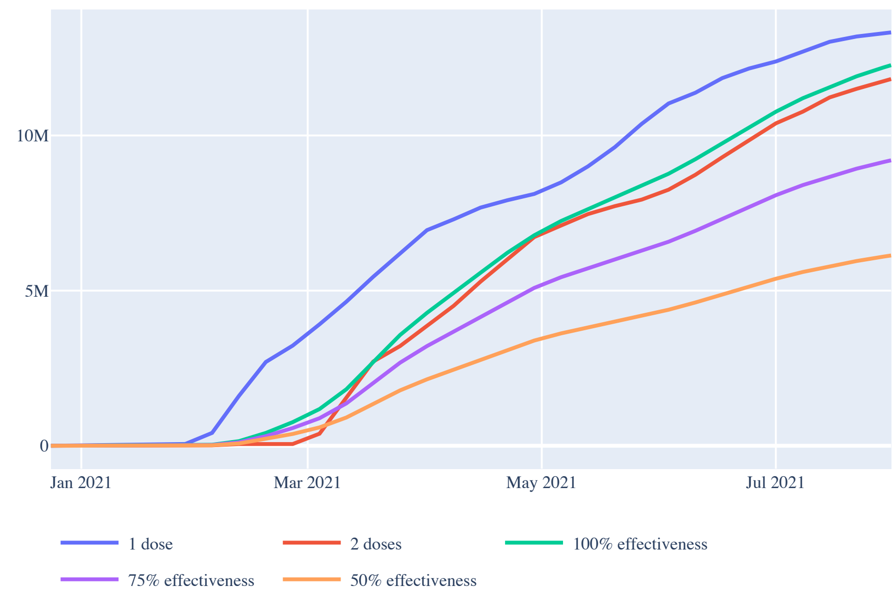
The economic block chooses mobility by balancing a quadratic cost of restrictions against a mortality-loss measure. A separate empirical relationship translates mobility into activity. The vaccine percentages below are **scenario assumptions about protection against infection**, rather than estimates of protection against hospitalisation or death.

Explore the model: states, equations, and mobility choice

Vaccine effectiveness and alternative scenarios

In this model, effective vaccination removes people from the susceptible group without them having to get sick. Protection does not arrive immediately. For this 2021 exercise, the vaccination chart assumes two doses 30 days apart, with full effectiveness reached 14 days after the second dose. Figure 1 shows first and second doses alongside the population effectively protected under 100%, 75%, and 50% effectiveness assumptions. The first dose contributes half of eventual effectiveness by day 30, building linearly. These illustrative percentages differ from the 95%, 60%, and 5% assumptions used in the mobility scenarios.

Figure 2: Vaccination process

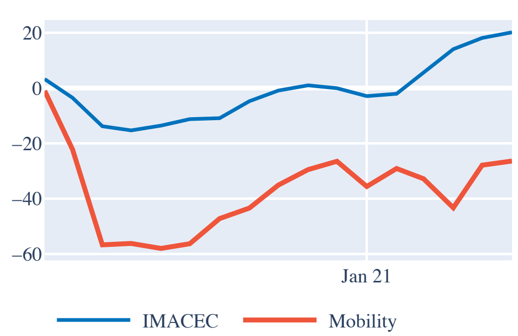


Note: this figure assumes that the first dose delivers half of its effectiveness by the end of day 30, and that the effectiveness gain from the day of injection is linear. The second dose delivers full effectiveness once 14 days have passed.

The effects of mobility restrictions on economic activity have not been homogeneous over time.

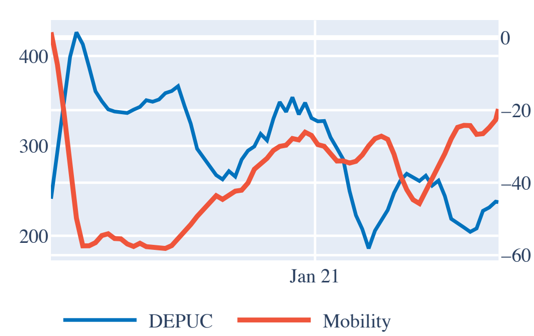
Figure 3: Mobility: economic activity and uncertainty

(a) Mobility versus economic activity



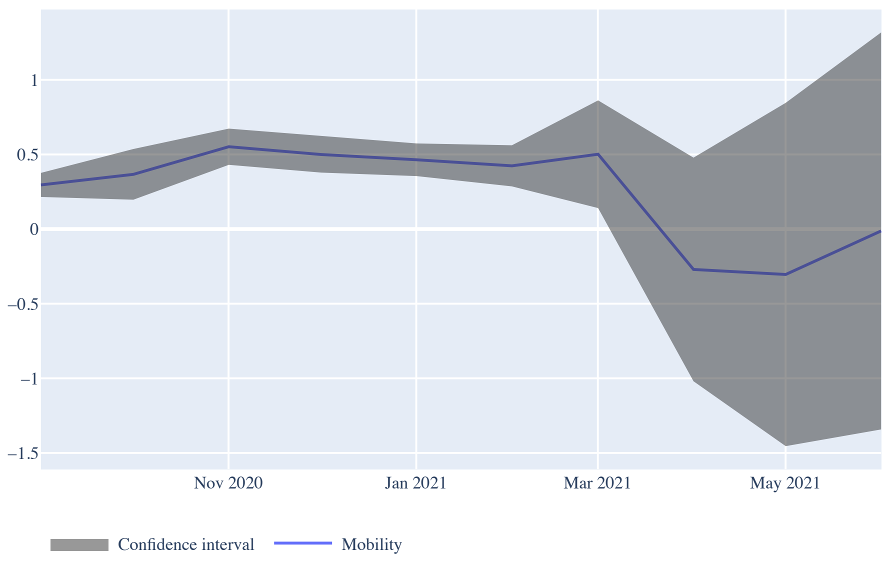
Note: observed mobility corresponds to the monthly average of the index compiled by Google. IMACEC is the percentage change, relative to the same month of the previous year, of the monthly economic activity index reported by the Central Bank of Chile.

(b) Mobility versus uncertainty



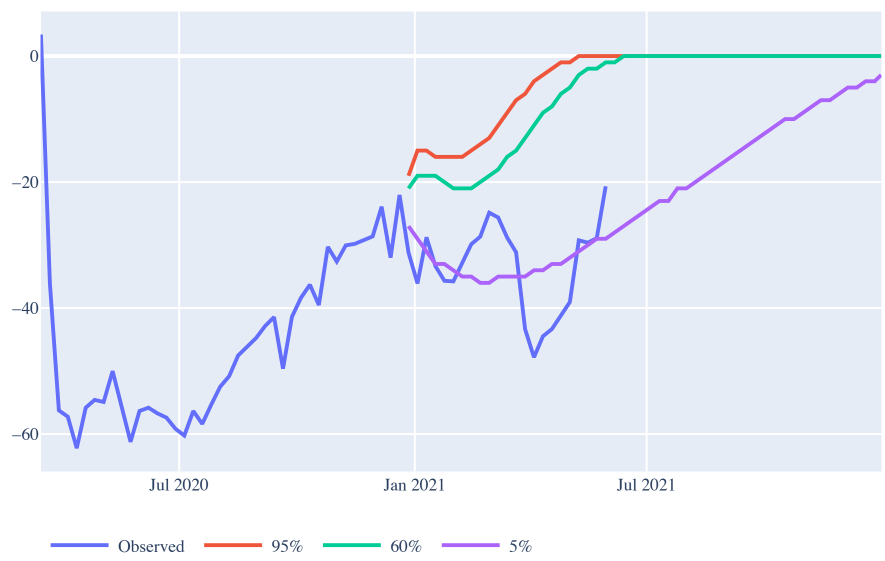
Note: observed mobility corresponds to the monthly moving average of the index compiled by Google. DEPUC from Becerra & Sagner (2020).

Figure 4: Relationship between activity and mobility



Note: the chart shows the coefficient from a regression of activity on mobility plus a constant. This regression was estimated using 8-observation rolling windows.

Figure 5: Return to pre-pandemic mobility



Note: observed mobility corresponds to the moving average of the index compiled by Google. The 95% line corresponds to the mobility projection using information through December 20, 2020 and assuming vaccine effectiveness of around 95%. The 60% and 5% calculations are analogous to the 95% one.

The observed mobility figures show that there are factors that have changed drastically relative to the base scenario.[1] These factors cannot be identified without assuming a vaccine efficacy and, therefore, are not estimated in our analysis. The contagion rate estimated when assuming 95% efficacy is 6 times higher than the maximum recorded before the vaccination process began. We interpret this as the model rejecting the 95%-efficacy hypothesis.

The vaccination chart illustrates a timing issue that the mobility counterfactuals do not separately model: the delay between inoculation and effective protection. Under the two-dose schedule assumed here, full protection takes about a month and a half from the first injection. The vaccination illustration should therefore not be read as a separate dose-by-dose model underlying the mobility projections.

Conclusion

Chile's rapid vaccination campaign means that a return to normality may finally be getting close. But **how close depends critically on how effective vaccines are at preventing contagion**. If vaccination substantially weakens the link between mobility and infections, restrictions can be relaxed sooner and economic activity can recover faster. If it does not, the *pandexit* will take longer.

Our estimates suggest that the difference could be economically meaningful. Under the 95%-efficacy scenario, mobility returns to normal roughly a month and a half earlier than under the 60% scenario. Over the following six months, this translates into an average mobility gap of about 4.7 percentage points and, using our estimated relationship between mobility and activity, **around 0.4–0.6 percentage points of annual GDP growth**.

That last calculation should be taken with a grain of salt. The regressions relating mobility to economic activity are deliberately simple and leave out many factors that changed simultaneously during the pandemic—fiscal support, uncertainty, firms' and households' adaptation, external conditions, and the composition of restrictions, among others. These omitted variables may bias the estimated relationship between mobility and activity. **The GDP figures should therefore be read as an illustration of the possible economic magnitude of a delayed *pandexit*, rather than as a causal estimate.**

The data arriving as the vaccination campaign progresses also give us reasons to be cautious about the most optimistic epidemiological scenario. Matching observed mobility under the assumption of 95% effectiveness against contagion requires a contagion rate around six times higher than anything estimated before vaccination began. Within the model, this makes the 95% scenario increasingly difficult to reconcile with what we are seeing.

The next few months will therefore be particularly informative. As vaccination advances and more data become available, we should learn much more about how strongly vaccines break the connection between mobility and contagion. **That connection will help determine not only when Chile can return to normal, but also how much economic activity is lost on the way there.**

Our World in Data

Visitar: https://ourworldindata.org/explorers/coronavirus-data-explorer?zoomToSelection=true&pickerSort=desc&pickerMetric=population&hideControls=true&Metric=People+vaccinated+%28by+dose%29&Interval=Cumulative&Relative+to+Population=true&Align+outbreaks=true&country=BRA~CHL~FRA~DEU~ISR~GBR~USA~URY~ESP~ITA~ARE

Visitar: https://ourworldindata.org/explorers/coronavirus-data-explorer?zoomToSelection=true&pickerSort=desc&pickerMetric=total_deaths&hideControls=true&Metric=Confirmed+deaths&Interval=7-day+rolling+average&Relative+to+Population=true&Align+outbreaks=false&country=BRA~CHL~FRA~DEU~ISR~GBR~USA~URY~ESP~ITA~ARE

[1] The base projection scenario uses estimates with data through December 20, 2020. After that, all shock innovations are assumed to disappear.

References

Rungcharoenkitkul, P. (2021): Macroeconomic Consequences of Pandexit, BIS Working Papers, Bank for International Settlements.