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Vaccination strategies in the midst of an epidemic

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As of the second half of September 2021, most European countries are taking decisions about (i) how forcefully to address vaccine hesitancy, and (ii) which non-pharmaceutical interventions (NPIs) to maintain at a time where hospitalisations and deaths have been reduced by vaccination but could pick up with increased societal contacts and worsening weather.

On vaccination, availability of vaccines and the logistics of delivery are no longer binding constraints for rich countries for now. The approval of multiple effective covid vaccines in record time represents a big success for our biomedical innovation ecosystem.² Of course, the fact that, at this point, only 2% of citizens of low-income countries have received at least one vaccine dose is very worrisome and should be addressed at the global level. High-income countries have an overwhelming ethical responsibility, for the common good and also for their self-interest, to decrease the probability of the emergence of new variants against which current vaccines could be ineffective.

In this Policy Insight, I discuss in turn the multiple hurdles for vaccination and lessons from the vaccination process so far.

1 Securing supplies

Once vaccines exist, one should be able to secure them. This section focuses on the European Union, which centralised discussions with pharma companies in order to obtain sufficient vaccine supplies at an appropriate price.

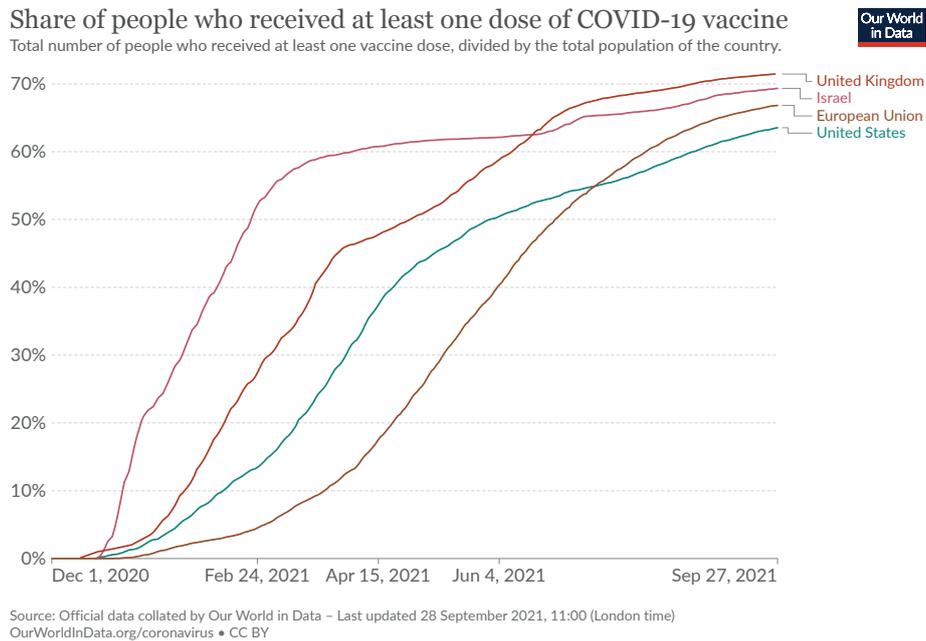
The European Commission has been criticised in the first months of 2021 for having insisted too much on low prices in their contractual negotiations with vaccine producers and not enough on speed of delivery, in a world where the opportunity cost

¹ This Policy Insight is partly based on Dewatripont (2021). I have benefitted tremendously from conversations with GEMS and GEMS+ colleagues on topics related to the covid crisis, but of course this paper is written in my own name and they should not bear responsibility for the ideas expressed here. I also thank Jean-Philippe Platteau for useful comments.

² Especially in the US (see Aghion et al. 2020).

of delaying the recovery was huge. This criticism is not unfair – Figure 1 shows that countries such as Israel, the UK and the US got ahead of the EU in vaccinations in the first half of 2021. This is particularly clear in the first quarter of 2021.

Figure 1



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Afterwards, the EU sped up its vaccination campaign. As we will see below, many Western European countries are now ahead of the US, the UK and Israel.

We should, moreover, not forget the benefits of the European Commission's intervention. It favoured equal treatment between member states, when a group of four countries (France, Italy, Germany and the Netherlands) had previously decided to join forces and bargain only for themselves. Thanks to the Commission, everyone agreed to go for centralised, EU-wide bargaining. This could be a useful precedent for future price negotiations with pharma companies in general, but also for covid vaccines. Pfizer CFO Frank D'Amelio's statement to financial investors is not reassuring. "In short, [he] explained that Pfizer expects its COVID vaccine margins to improve. Under one pandemic supply deal, Pfizer is charging the US \$19.50 per dose, [he] said, which is 'not a normal price like we typically get for a vaccine—\$150, \$175 per dose. So, pandemic pricing'" (Sagonowski 2021). Next to massively boosting world supply and ensuring affordable access to current covid vaccines for poor countries, it is important not to forget the need to avoid rents above competitive rates of returns for future versions of covid vaccines to be purchased by rich countries.

2 Setting up delivery systems

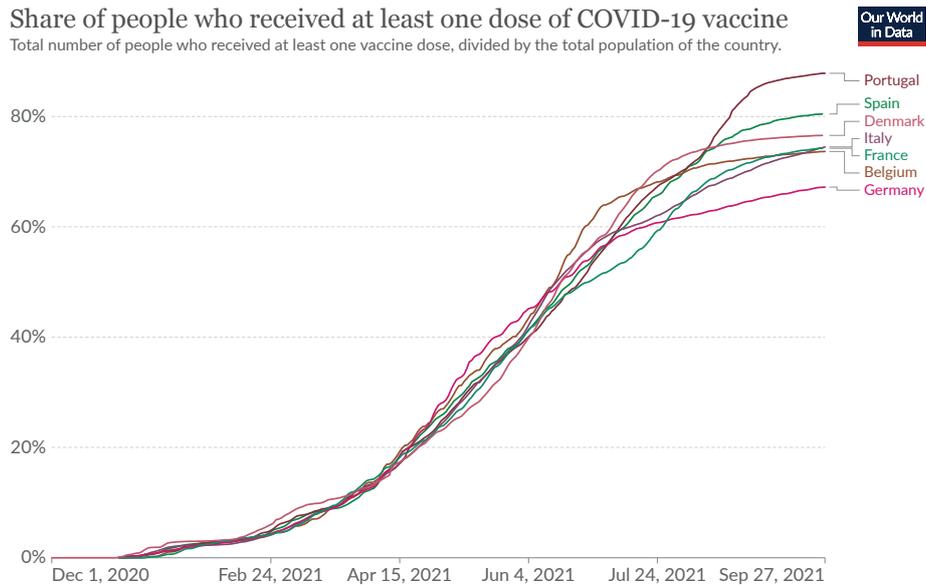
Figure 2 shows that, thanks to the Commission, vaccination rates rose with little variance across member states in the first five months of 2021. Note that in this Policy Insight I will focus on Western EU member states³ for the sake of comparability, and Figure 2 displays a diversity of situations among them, which we will detail below.

³ In other words, the pre-Eastern enlargement EU.

Figure 2

Share of people who received at least one dose of COVID-19 vaccine

Total number of people who received at least one vaccine dose, divided by the total population of the country.



The bottom line is that the various countries managed to set up vaccine delivery systems with broadly similar efficiency. Maybe this is because supply was delayed; it is not clear that all countries would have been as efficient as Israel if they had had a similarly rapid supply.

3 Addressing vaccine hesitancy/hostility

As Figure 2 shows, the variance in vaccination rates starts to increase when first doses start to slow down for some countries, but mostly at levels deemed insufficient given new variants. And this objective should be reached fast, since one talks about ‘the race between vaccination and variants’.

Under these circumstances, significant tensions have been observed in a number of countries between the idea of ‘free choice about vaccination’ and increasingly coercive methods to induce/mandate vaccination. Interestingly, ‘corona passes’ documenting vaccination, recovery or a recent negative test were quickly introduced as a condition for crossing borders in the EU as an international tourist without much controversy. The same was not true of their domestic use, which has generated strong opposition to a ‘corona pass society’ accused of being synonymous with discrimination and polarising private enforcement. Nonetheless, a minority of countries moved quickly towards requiring a corona pass to access big events as well as cultural activities, fitness and sports clubs and hospitality venues (Israel, Denmark). The majority of countries took much more time, but by now many have introduced a corona pass in one form or another.⁴

The controversy about corona passes has been intensified significantly by the fact that authorities in most rich countries initially stated two things that were potentially contradictory: (1) vaccination should be a personal choice, and (2) we plan to reach ‘herd immunity’. The latter is not an exact number, but early on it was commonly set

⁴ See <https://www.euronews.com/travel/2021/07/26/green-pass-which-countries-in-europe-do-you-need-one-for>.

at a vaccination rate of 70% of the total population, based on the original virus. It is now significantly higher (up to 90%) given the delta variant. The big challenge has then been: what if (1) and (2) are not compatible?

It would have been more astute to say: “With limited vaccine supply and high uncertainty early on about side-effects of these new vaccines, we shall start with volunteers, to whom we are grateful, and we shall fine-tune the strategy along the way while trying to accommodate legitimate vaccine fears as much as possible”. It could be argued that stating (1) and (2) above, rather than this more cautious line, was maybe one of the most significant communication blunders in a crisis that has been rich in failures in this respect. Many such communication failures stem from a distaste for the unavoidable uncertainty the virus implies. People want ‘perspectives’, which leads authorities to promise a noncontingent ‘return to pre-covid freedoms’ that puts aside the intrinsic uncertainty about ‘what the virus is up to’, and also about ‘what the population is up to’ in terms of willingness to follow NPIs or be vaccinated. This feeds into pandering to ill-informed voters by political authorities (‘we can trust the population about vaccination decisions and everything will be fine’), which is bound to disappoint and require ‘flip-flopping’.

Statement (1) was moreover very surprising in a time of crisis when, for most of 2020, many individual rights had been constrained (thereby generating much inequality) in ways not seen since the end of World War II – the right to work, to be educated, to circulate, to meet in groups, and so on. All this was done in an increasingly ‘sophisticated’ way over time to better fine-tune ‘proportionality’ in balancing concerns over individual rights with public health concerns for each measure. Why did the ‘right not to be vaccinated’ have to be ‘sanctified’ so much instead of saying that the same cost-benefit analysis should be applied with vaccination too (as is done with other vaccines, by the way)? The criticisms of corona passes mentioned above are valid, but they have to be weighed against the very high effectiveness of vaccines in terms of lives saved and their very small financial cost (less than €4 for two doses of the AstraZeneca vaccine, €24 for two doses of the Pfizer/BioNTech vaccine and €36 for two doses of the Moderna vaccine in the original contracts signed by the European Commission).

This being said, while communication about the vaccination strategy has clearly suffered from insufficient caution, the gradual strategy followed in the first half of 2021 also had clear merits. Interestingly, the idea of a ‘gradualist strategy’ echoes a debate that took place 30 years ago over the transition from a centrally planned economic system to a market economy following the change of economic strategy in China after Mao’s death and in the former Soviet Union after the fall of the Berlin Wall. As I argued then in two papers with Gérard Roland (Dewatripont and Roland 1992, 1995), in an uncertain environment it is advantageous to start first with ‘more efficient and popular’ policy measures, and thereby potentially build momentum for further reforms. This is what was done here – start by vaccinating more vulnerable individuals (whose benefit from vaccination is greater) and individuals eager to get vaccinated and then, if the vaccine turns out to be efficient and safe (which has been the case), build on this virtuous circle to vaccinate people who have gradually been convinced to get vaccinated.

The second advantage this gradualist strategy is that it maximises the number of individuals who get vaccinated ‘really voluntarily’. Psychologists and other scientists have rightly stressed the advantage of such an approach and documented through surveys the fact that, in many countries, a significant number of individuals moved over time towards vaccination after seeing that people who got vaccinated were safe and that the people who were getting seriously ill and possibly dying were mostly

unvaccinated.⁵ This is indeed a first-best outcome in cases where a sufficient proportion of the population is vaccinated willingly (such as the Belgian region of Flanders, which has reached a vaccination of 80% by now).

Moreover, as to the key question, “What if one does not reach sufficient vaccination through mere ‘positive persuasion’?”, aside from objections over discrimination and invasive enforcement, a key additional objection to corona passes concerns their potential impact. What if unvaccinated people react negatively if one ‘reneges’ on their ‘vaccination freedom’? Survey evidence from psychologists and other scientists has shown a pretty robust contrast.⁶ While a majority of vaccinated people say they would approve of the introduction of corona passes, people who do not plan to get vaccinated say they are broadly opposed to their potential introduction and in fact would not react more positively towards vaccination. So, not only could these passes be divisive, but there is also a risk that they could be counterproductive in terms of vaccination.

At the same time, this survey evidence relates to hypothetical situations. How confident can we be that individual choices will be consistent with the answers from these surveys? We are accumulating more and more actual experiences with corona passes. However, assessing these episodes in detail goes beyond this short paper, which simply discusses the evolution of vaccination rates across a number of countries, with a special focus on the French experience.

4 Natural experiments

Comparing strategies across countries is not easy, because we cannot set ‘everything else equal’, so that *comparaison n’est pas raison*.

We can, however, learn something about the impact of a given vaccination strategy by looking at natural experiments, i.e. a specific policy changes which can give information about ‘actual’ policy. Looking at the dynamic evolution of the vaccination performance of the country where the experiment took place relative to other countries can give us interesting insights, even if we won’t carry out here a proper ‘differences-in-differences’ analysis.

The next section therefore puts the French corona pass experiment in an international perspective. France is potentially quite informative because the corona pass was announced solemnly on French TV by President Macron on 12 July with a well-defined timetable (it included a vaccination requirement for healthcare personnel, and a sanitary pass requirement in particular for cinemas and museums as of July 21 and hospitality venues as of 9 August).

5 International comparisons

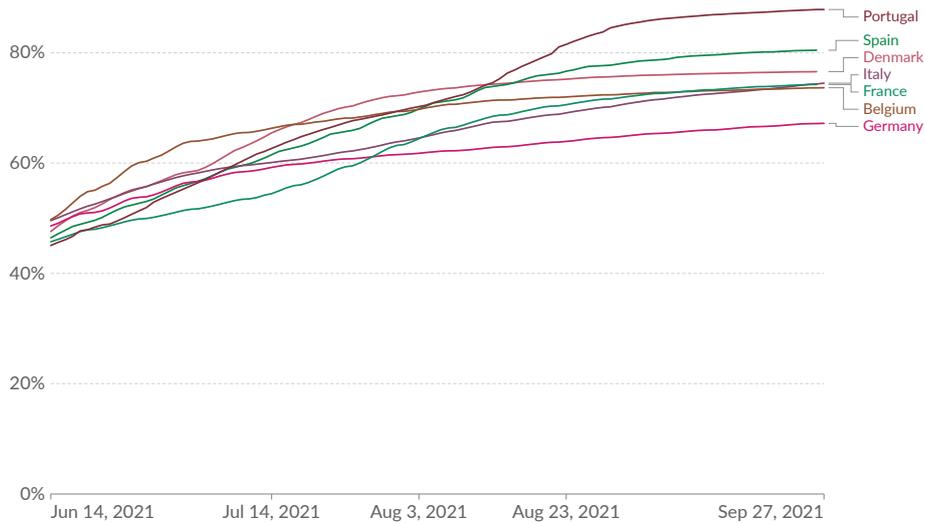
Zooming in on Figure 2 from mid-June onwards, we see a lot of movement in this subset of countries (Figure 3). At the start of the period, Belgium was the top performer until mid-July. Portugal was briefly the bottom performer but was quickly replaced by France, which remained there until the end of July, only to be replaced by Germany up to now. In mid-July, Denmark became the top performer for roughly a month and was then replaced by Portugal, which is now far ahead.

⁵ See, for example, the Belgian Motivation Barometer series (<https://motivationbarometer.com/fr/>) and the Belgian Corona Study (<https://www.uantwerpen.be/nl/projecten/coronastudie/>) organised by the Universities of Antwerp and Hasselt.

⁶ See the Belgian Motivation Barometer and Belgian Corona Study, as well as de Figueiredo et al. (2021).

Figure 3

Share of people who received at least one dose of COVID-19 vaccine
 Total number of people who received at least one vaccine dose, divided by the total population of the country.



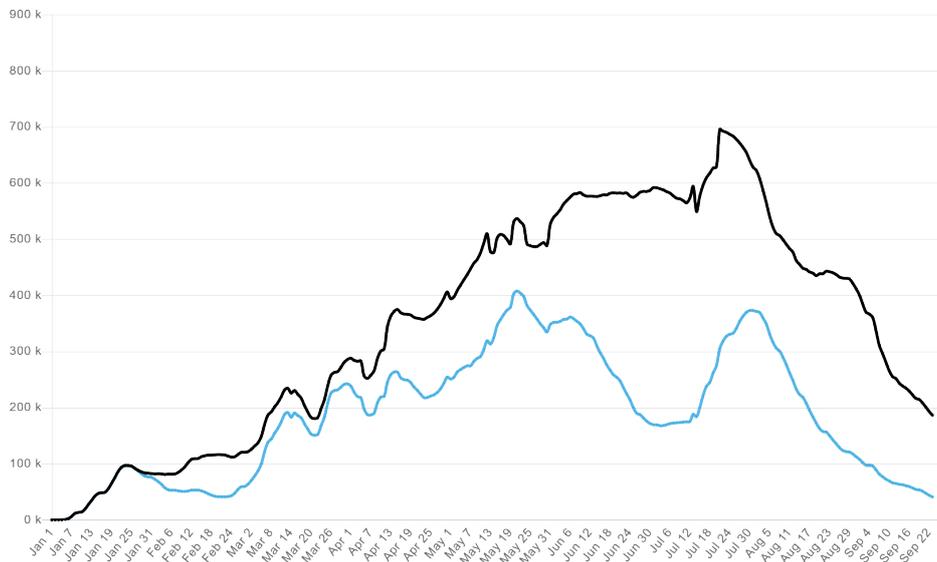
Source: Official data collated by Our World in Data - Last updated 28 September 2021, 11:00 (London time)
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Let us now turn to a comparison of France’s performance with a broader set of countries and look at the ranking on three dates, starting on 12 July when President Macron announced his new corona pass strategy.

The immediate impact of this announcement was a ‘vaccination appointment rush’, with almost one million vaccination appointments made within 24 hours.⁷ This response was stronger than even the supporters of the pass had hoped for.

Figure 4 Total daily doses (black) and daily first doses (blue)



Source: French Ministry of Health.

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7 See https://www.liberation.fr/societe/sante/vaccination-tous-piques-de-doctolib-apres-les-annonces-de-macron-20210712_A7D33PZ4Y5HFPP6ZIW5TZLQZDA/

More significantly, Figure 4 (from <https://covidtracker.fr/vaccintracker/> and based on data from the Ministry of Health) shows a rebound of daily first doses, which changed the vaccination dynamics for weeks. In this Policy Paper, I will focus on the number of first doses (i.e. of partially vaccinated people), which is the appropriate indicator at a time when vaccine *supply* is no longer the binding constraint but vaccine *hesitancy* instead, so that the key hurdle is convincing people to get their first dose.

While this evidence strongly suggests that Macron's plan helped increase vaccination rather than slowing it down, it of course does not mean that it convinced everybody. Every Saturday, multiple demonstrations are organised across France by opponents to the policy, involving more than 200,000 participants for each of the first three weeks of August before gradually receding. On the other hand, more than 13 million French people have decided to get vaccinated since 12 July.

Moreover, looking now at the geographical dimension and its evolution over time, the next three graphs indicate how France has risen spectacularly in the 'vaccination ranking' since 12 July. The graphs compare the latest information to the 12 July numbers for the pre-Eastern enlargement EU countries (or 'EU15', including the UK) plus Israel and the US. The analysis is only suggestive and would be worth refining, but it is already quite instructive.

12 JULY TO 14 AUGUST

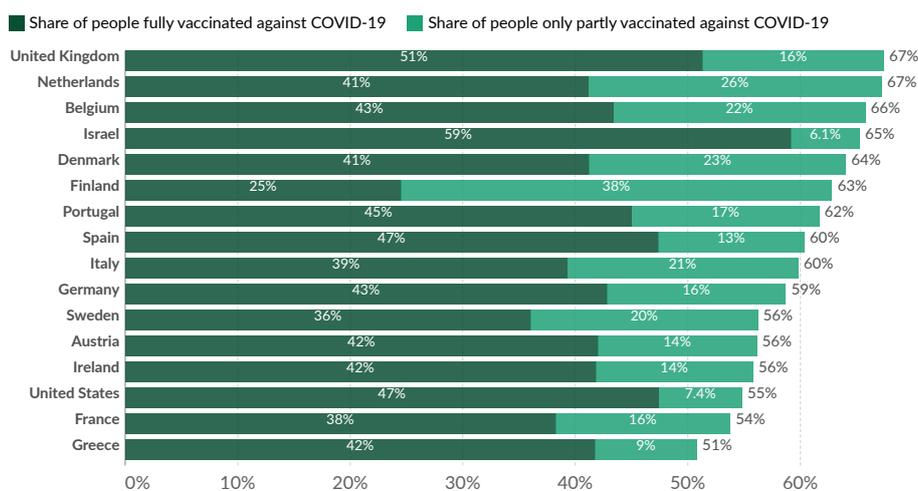
Looking at France, we see that it was ranked 16th out of the 17 countries selected on 12 July but ranked 9th on 14 August, thanks to a 14 percentage-point increase in the share of its total population at least partly vaccinated (from 54% to 68%). Again, this indicates that the Macron plan did not backfire, at least until now (daily new vaccinations have slowed somewhat, but were still at 260,750 on 12 August, prompting the French authorities to stop testing free of charge).

Figure 5

Share of people vaccinated against COVID-19, Jul 12, 2021

Alternative definitions of a full vaccination, e.g. having been infected with SARS-CoV-2 and having 1 dose of a 2-dose protocol, are ignored to maximize comparability between countries.

Our World
in Data



Source: Official data collated by Our World in Data. This data is only available for countries which report the breakdown of doses administered by first and second doses in absolute numbers.
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This being said, while France did very well in this period with its 14% rise, it is by no means alone. Three other countries also experienced a 14% increase, and two of these (Portugal and Spain) were starting from a significantly higher level than France on 12 July. In fact, there is quite some variation in performance, and we could classify our 17 countries into five groups, defined in decreasing position on 12 July:

1. The countries which 'peaked early': the UK, Israel and the Netherlands. These made up the top three on 12 July but not by 14 August, because they improved by only 1 or 2 percentage points.
2. The countries which 'progressed moderately from a good base': Belgium (+5 percentage points and a stable 4th rank) and Finland (+6 percentage points and a slightly worse rank).
3. The countries which 'made very impressive progress' and now make up the top three: Denmark (+11 percentage points) and Spain and Portugal (both +14 percentage points).
4. The countries that 'progressed very significantly from a low base': Sweden (+10 percentage points), Ireland and France (both +14 percentage points).
5. The countries that 'showed slow progress from a weak base': Luxembourg, Germany, Austria, the US and Greece, all with an increase of 4 to 5 percentage points.

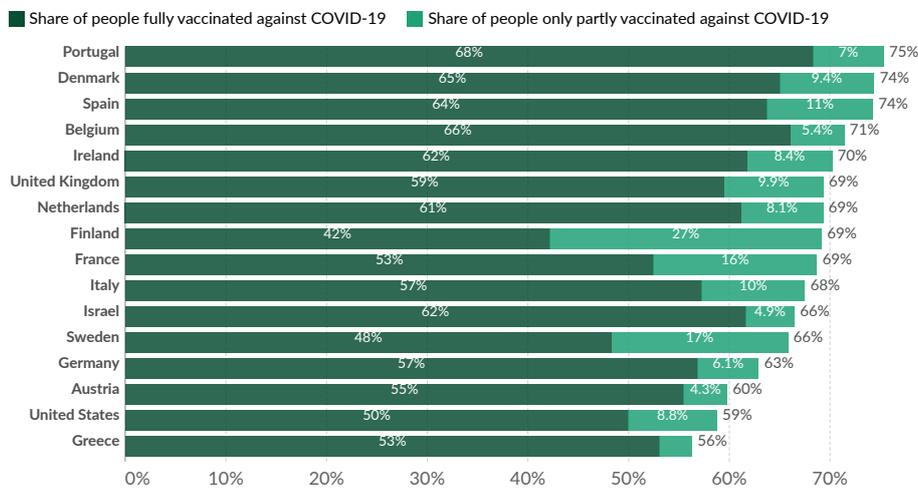
Note that Italy, with an increase of 7 percentage points from a starting point of 60%, is 'in-between' groups 2 and 5.

Figure 6

Share of people vaccinated against COVID-19, Aug 14, 2021

Alternative definitions of a full vaccination, e.g. having been infected with SARS-CoV-2 and having 1 dose of a 2-dose protocol, are ignored to maximize comparability between countries.

Our World
in Data



Source: Official data collated by Our World in Data. This data is only available for countries which report the breakdown of doses administered by first and second doses in absolute numbers.
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15 AUGUST TO 20 SEPTEMBER

In this latter period, we see a slowdown in vaccination progress and much less variation, but a continuation of relative trends for many of those who performed well in the earlier period.

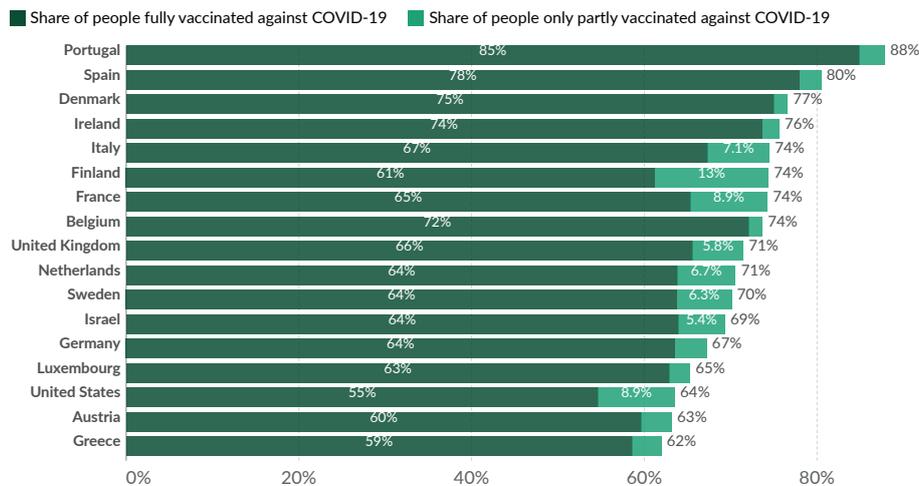
1. Portugal is the exception, with +13 percentage points; all the others saw increases equal to or under 7 percentage points.
2. Spain, France and Ireland are at +6 percentage points, having continued their progress so far but at (ever) decreasing rate. The latter two are matched by Finland and Italy in terms of level and speed in this period.
3. Denmark has slowed down (+2 percentage points) and has decided it is now 'safe' and has 'restarted normal life' for the time being. However, it remains in the top three for now.
4. A number of countries have slowed down to between +1 and +3 percentage points (just like Denmark, but with a lower rank). In descending order, these are Belgium, the UK, Netherlands, Israel and Luxembourg.
5. Finally, a number of low performers are now accelerating a bit, with +4 percentage points for Sweden and Germany, +3 percentage points for Austria, +5 percentage points for the US and even +6 percentage points for Greece.

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Figure 7

Share of people vaccinated against COVID-19, Sep 27, 2021

Alternative definitions of a full vaccination, e.g. having been infected with SARS-CoV-2 and having 1 dose of a 2-dose protocol, are ignored to maximize comparability between countries.

Our World
in Data

Source: Official data collated by Our World in Data. This data is only available for countries which report the breakdown of doses administered by first and second doses in absolute numbers.
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At least five conclusions emerge from this comparison vaccination performances across the whole period.

1. It has been good for France, whose vaccination rate rose from 54% to 74% and whose rank rose from 16th to 7th. It looks like a large part of this gain was due to the corona pass.
2. That being said, Spain also achieved an increase of 20 percentage points starting from a higher base, and this without a corona pass, which was decided by the government but blocked by courts.
3. The best performer by far is Portugal, with an increase of 27 percentage points in two and a half months taking it ahead of second place by 8 percentage points.

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4. A number of countries where the corona pass has been introduced are not as impressive, including Germany, Austria and Luxembourg.
5. Belgium has managed to do well on average with a very limited use of corona passes so far. Its specificity is its high interregional variance, with Flanders doing as well as Spain, Wallonia at the level of Israel, and Brussels 8 percentage points behind Greece. Unsurprisingly, Brussels, but also Wallonia, will see the generalisation of the corona pass on 15 October.

Research is needed to understand why the introduction of a corona pass has had a big impact in France but much less so in some other countries. One might hypothesise that its centralised, solemn introduction with a clear goal (75% of the population with a first dose by early September, a goal which wasn't reached by that date but has just about been achieved now) led to a big immediate response, which probably started a virtuous circle.

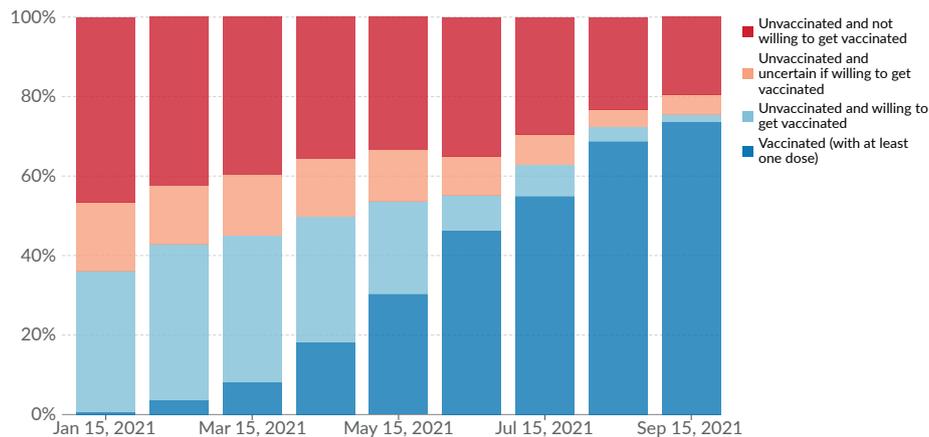
It is interesting to note that no 'aggregate backlash' seems to have taken place, as the next graph shows. While France started 2021 with 46.5% of its population unwilling to get vaccinated and 35% by mid-June, this number is now just below 20%. In contrast, Germany, displayed in the following graph, started 2021 with 30.7% of its population unwilling to get vaccinated but is now slightly higher than France at 22%.

Figure 8

Willingness to get vaccinated against COVID-19, France, Jan 15, 2021 to Sep 15, 2021

Our World
in Data

Share of the total population who has not received a vaccine dose and who are willing vs. unwilling vs. uncertain if they would get a vaccine this week if it was available to them. Also shown is the share who have already received at least one dose.



Source: Imperial College London YouGov Covid 19 Behaviour Tracker Data Hub – Last updated 21 September 2021, 08:10 (London time)
Note: Months containing fewer than 100 survey respondents are excluded. We infer willingness to get vaccinated in a country's population from survey responses of people aged 18 years and above, which may not be representative of the entire population. Nevertheless, we expect such differences to be small.
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Taking now a broader view, it is interesting to see that, as of 26 September the Southern Latin countries – Portugal, Spain, Italy and France – are demonstrating a pretty good performance with vaccination rates between 74% and 88%, while the Germanic countries – the Netherlands, Germany, Luxembourg and Austria – are at between 63% and 71%⁸. Interestingly, this is quite a contrast with overall covid 'performance' so far. Total covid deaths per 100,000 inhabitants are currently between 175 and 217 for the Latin group and between 105 and 135 for the Germanic group. In particular, the very big contrast between the four big EU countries in the first wave (Italy, Spain and France versus Germany) even led to cultural interpretations (in terms of social contacts) of covid performance (Platteau and Verardi 2020).

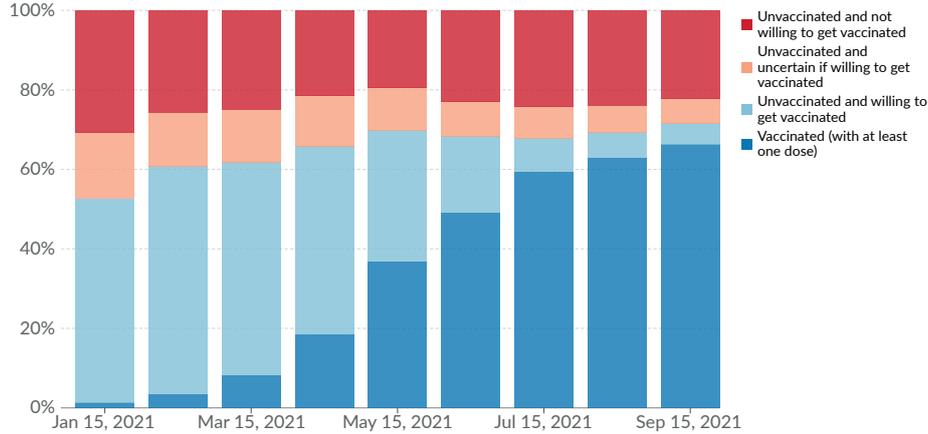
⁸ Belgium is an exception, with Flanders (but not our German-speaking community) being much more vaccinated than Wallonia (and even more so than Brussels, which is more French-speaking than Dutch-speaking).

Figure 9

Willingness to get vaccinated against COVID-19, Germany, Jan 15, 2021 to Sep 15, 2021



Share of the total population who has not received a vaccine dose and who are willing vs. unwilling vs. uncertain if they would get a vaccine this week if it was available to them. Also shown is the share who have already received at least one dose.



Source: Imperial College London YouGov Covid 19 Behaviour Tracker Data Hub – Last updated 21 September 2021, 08:10 (London time)
 Note: Months containing fewer than 100 survey respondents are excluded. We infer willingness to get vaccinated in a country's population from survey responses of people aged 18 years and above, which may not be representative of the entire population. Nevertheless, we expect such differences to be small.
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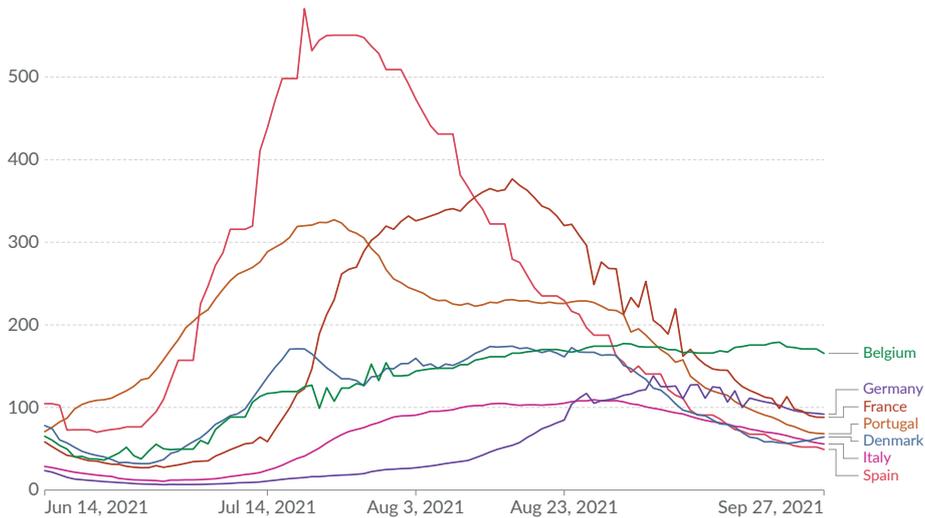
While we have to be very cautious, vaccination progress is naturally correlated with the summer flare-ups these Southern European countries have experienced, which are depicted in the following graph. Such flare-ups naturally 'focus' the minds of political authorities (while in the summer they are typically on vacation, like everybody else) and also increase vaccination willingness among the population.

Figure 10

Daily new confirmed COVID-19 cases per million people



Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.



Source: Johns Hopkins University CSSE COVID-19 Data

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Concerning Portugal's stellar performance, it may have been influenced by the fact that, after a pretty good performance in 2020, it was hit by a massive wave of infections in early 2021 at a time where vaccination was starting, so that it has chosen caution throughout 2021 so far when deciding on its NPIs. Note that the country announced

an expanded use of the corona pass on 9 July. Finally, Portugal seems to have benefited from having very few ‘antivaxxers’ and quite a large degree of political consensus on its covid strategy.⁹

6 Conclusions

This Policy Insight has discussed the stages of vaccination strategies pursued in Europe. Among the lessons to be drawn and the questions to investigate, we can stress the following.

1. We should not draw the ‘wrong’ lessons from the EU vaccine purchases. Yes, there is a trade-off between prices and speed of supplies, which should be tilted towards speed in the middle of a pandemic but is different in quiet times. EU-level bargaining has been a development induced by the crisis worth holding to.
2. Most Western EU countries considered here proved able to distribute the vaccines in a timely fashion.
3. Vaccine hesitancy has been the major hurdle in the process, exacerbated by imprudent announcements of generalised vaccination freedom, which turned out not to be compatible with desired vaccination levels.
4. Vaccination proceeded well in the first six months of the year – the gradualist strategy worked, with more and more individuals becoming convinced to be vaccinated without coercion.
5. Once a ‘vaccination ceiling’ was reached, however, many countries moved towards indirect coercion in the form of corona passes, which are more ‘discriminatory’ than vaccination mandates but seemingly easier to gain political acceptance since, until now, they have mostly been limited to ‘non-essential activities’ (tourism, cultural events, sport, hospitality, non-food shops)¹⁰ and allow testing as an alternative option.
6. This instrument has not been decisive everywhere. Some countries and regions reached very high vaccination rates with limited recourse to a corona pass (Spain, Flanders), while others have not yet achieved high vaccination rates despite having introduced it quite some time ago (Germany, Luxembourg, Austria).
7. In France, the corona pass seems to have played a key role and has even been accompanied by a reduction in the share of the population saying they are unwilling to be vaccinated. The ‘backlash’ feared from survey evidence has not happened in France, even if a minority of the population is strongly against corona passes.
8. Regions such as Brussels and Wallonia, which are currently planning to significantly expand the applicability of corona passes, should probably try to follow the example of France with its clear communication of the political commitment to the measure, with an explicit vaccination target and sufficient resources to make vaccination as easy as possible. As stressed by psychologists, in order to minimise opposition to the measure, it is important

⁹ See <https://www.reuters.com/world/europe/portugal-lifts-night-time-curfew-covid-19-vaccination-speeds-up-2021-07-29/>, <https://www.reuters.com/world/europe/portugal-fully-vaccinates-80-population-against-covid-19-2021-09-15/> and <https://www.9news.com.au/world/coronavirus-covid-vaccine-rate-in-portugal-tops-80-percent-leading-to-declaration-of-victory-against-the-virus/ff64aae9-81d3-4695-ad3c-48f8114c120b>.

¹⁰ It will be interesting to follow the evolution of vaccination in the US and Italy, which recently introduced corona pass requirements for work.

to properly communicate its overall benefit in fighting the epidemic and therefore benefiting everybody instead of presenting it just as a coercive strategy.¹¹

9. Portugal stands out as the ‘vaccination champion’ for now. This success cannot really be attributed to a single cause. Next to the introduction of a corona pass, the big wave of infections that hit at a time when vaccination was starting, and the rebound faced by this tourist destination this summer, must have played a significant role; the same is true of the political cohesion on the covid strategy and the absence of a sizable ‘antivaxx’ movement in the country.
10. Further research is needed to better understand the determinants of vaccination success, which will call for multidimensional, and multidisciplinary, analysis.

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¹¹ See the Belgian Motivation Barometer and Vansteenkiste and Van den Bergh (2021).

ABOUT THE AUTHOR

MATHIAS DEWATRIPONT holds a Ph.D. in Economics from Harvard University, 1986. He has been a Professor at Université Libre de Bruxelles (ULB) since 1990 (part-time between 2011 and 2017, where he was Executive Director of the National Bank of Belgium (NBB), and its Vice-Governor between June 2014 and March 2015). Between 1991 and 2001, he co-directed ECARES, which is now part of the Solvay Brussels School of Economics and Management of ULB. Between 1998 and 2011, he was Research Director of CEPR as well as part-time Visiting Professor at MIT. Between 2005 and 2012, he was a founding Member of the Scientific Council of the European Research Council. As Executive Director of NBB, he served as Member of the Basel Committee on Banking Supervision and of the Supervisory Board of the European Central Bank. Currently, he co-directs ULB's Institute for Interdisciplinary Innovation in Healthcare (I3h).

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