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UNDERSTANDING DIFFERENCES IN VACCINATION UPTAKE AMONG OECD COUNTRIES

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ABSTRACT/RESUMÉ

Understanding differences in vaccination uptake among OECD countries

Resolving stark differences between rich and poor countries in vaccine coverage against COVID is a global policy priority for 2022. However, even among OECD countries, there currently remain surprisingly large differences in vaccine coverage and this paper attempts to explain these differences, including the role that policy has played. The main findings are: vaccination has had massive health and economic benefits; vaccine hesitancy can be overcome, although there remains a link with historical flu and MMR vaccination rates; well-designed vaccine passes can boost coverage; trust in government and other public institutions matter, although the link to vaccine coverage is not straight-forward; demographic structure and policy stances towards vaccinating children play a role in explaining differences in overall population vaccination rates; mandatory vaccination has been implemented or is being considered in a few OECD countries, although it is too early to assess the effects. Finally, case studies of the most successful vaccination campaigns provide additional illumination, which cannot easily be captured in multi-country correlations.

Keywords: Sars-Cov-2, COVID, vaccine hesitancy, COVID certificates, vaccine pass, vaccination rate

JEL: E61: Macroeconomics and Monetary Economics / Macroeconomic Policy, Macroeconomic Aspects of Public Finance, and General Outlook / Policy Objectives; Policy Designs and Consistency; Policy Coordination; I18: Health, Education, and Welfare / Health / Health: Government Policy; Regulation; Public Health

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Comprendre les différences de taux de vaccination entre les pays de l'OCDE

Résoudre les différences marquées entre les pays riches et les pays pauvres en matière de couverture vaccinale contre le COVID est une priorité politique mondiale pour 2022. Cependant, même parmi les pays de l'OCDE, il subsiste actuellement des différences étonnamment importantes dans la couverture vaccinale et ce document tente d'expliquer ces différences, y compris le rôle que la politique a joué. Les principaux résultats sont les suivants : la vaccination a eu d'énormes avantages pour la santé et l'économie ; l'hésitation à la vaccination peut être surmontée, bien qu'il reste un lien avec les taux historiques de vaccination contre la grippe et le ROR ; des laissez-passer pour les vaccins bien conçus peuvent accroître la couverture ; la confiance dans le gouvernement et les autres institutions publiques est importante, même si le lien avec la couverture vaccinale n'est pas simple ; la structure démographique et les positions politiques vis-à-vis de la vaccination des enfants jouent un rôle dans l'explication des différences dans les taux de vaccination de la population globale ; la vaccination obligatoire a été mise en place ou est envisagée dans quelques pays de l'OCDE, bien qu'il soit trop tôt pour en évaluer les effets. Enfin, les études de cas des campagnes de vaccination les plus réussies fournissent un éclairage supplémentaire, qui ne peut pas être facilement capturé dans les corrélations multi-pays.

Mots clés: Sars-Cov-2, COVID, hésitation vaccinale, certificats COVID, passeport vaccinal, taux de vaccination

JEL : E61 : Macroéconomie et économie monétaire / Politique macroéconomique, Aspects macroéconomiques des finances publiques et Perspectives générales / Objectifs politiques ; conceptions et cohérence des politiques ; coordination des politiques ; I18 : Santé, éducation et bien-être / Santé / Santé : politique gouvernementale ; Régulation; Santé publique

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Understanding differences in vaccination uptake among OECD countries

By: David Turner, Nicolas Woloszko, Thomas Chalaux and Marnix Dek [1]

1. Introduction

1. It is a remarkable achievement that, within a year of the start of the pandemic, several vaccines had been developed and the challenge has since been to manufacture, distribute and deploy them. There remains a massive difference in the share of the population that are fully vaccinated between rich and poor countries - ranging from less than 1% in Chad, 3% in Nigeria to 92% in Portugal and 95% in the United Arab Emirates.[2,3] Such differences are mostly explained by supply and logistical issues in deploying the vaccines and represent one of the pre-eminent global policy challenges for 2022 (World Health Organisation, 2021[1]). However, even among OECD countries where supply and logistical problems are mostly no longer a major constraint, there remain large differences in the share of the population that are fully vaccinated (Figure 1). The purpose of this paper is to try to understand these differences across OECD countries, including the role that policy has played as well as their importance for health and economic outcomes. The paper relies mostly on simple descriptive statistics, focuses on countries where coverage has been particularly strong or particularly weak, and includes a selective review of the literature.

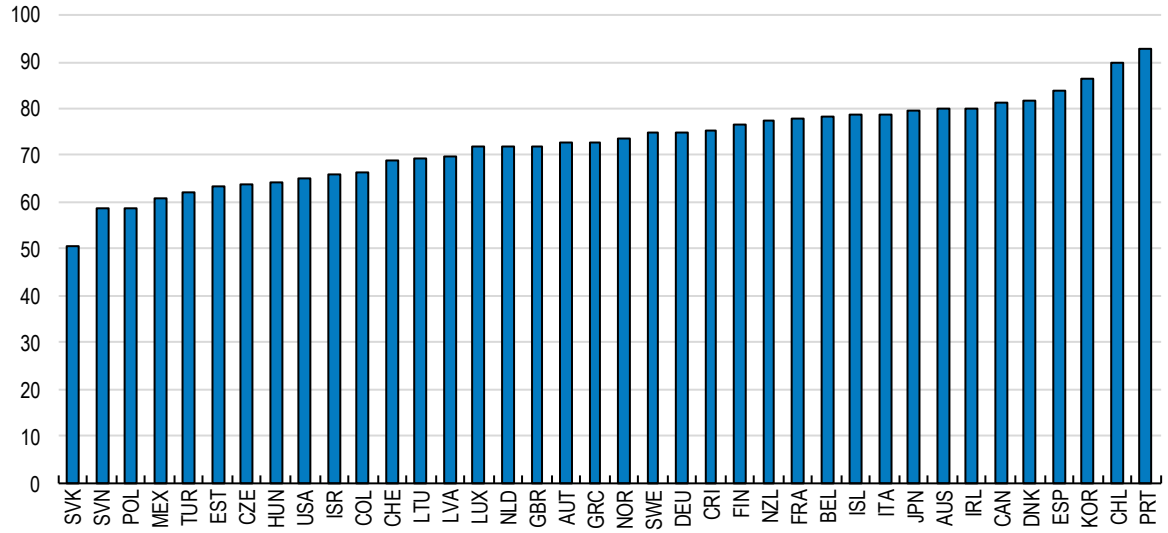
[1] The authors are members of the Macroeconomic Analysis Division of the OECD Economics Department. They would like to thank Luiz de Mello, Alain de Serres, Gabriel Machlica, colleagues on Country Desks in the Economics Department, colleagues from the Employment, Labour and Social Affairs Directorate and delegates of Working Party No. 1 of the OECD Economic Policy Committee, for useful comments and suggestions. Many thanks also to Veronica Humi for editorial assistance.

[2] With data as of 11th of March 2022 from *Our World in Data.*

[3] Throughout this note "full vaccine coverage" will refer to the total number of people who received full doses prescribed by the initial vaccine protocol divided by the total population of the country. Alternative definitions of vaccination, for example having been infected or having one dose of a two doses protocol, are ignored in order to maximise cross-country comparability.

Figure 1. The share of the population fully vaccinated in OECD countries

Per cent, data for the 11th of March or nearest period.



Note: Total number of people who received full doses prescribed by the initial vaccine protocol divided by the total population of the country. Alternative definitions of vaccination, for example having been infected or having one dose of a two doses protocol, are ignored in order to maximise cross-country comparability.
Source: *Our World in Data*, downloaded on the 11th of March 2022.

2. Evidence of the benefits from higher vaccination levels

2.1. Evidence of health benefits

2. There is overwhelming evidence from extensive clinical trials and real world experience that vaccines provide protection against the most severe outcomes of COVID-19.[4] Many innovative econometric studies provide impressive quantifications of the scale of health benefits from vaccinations so far, including:

- Across the WHO European regions, it is estimated that between December 2020 and November 2021 vaccination has averted around one half of deaths among those aged over 60 that would have been expected in the absence of vaccines (Meslé et al., 2021[2]).
- For the United States, (Moghadas et al., 2021[3]) use an age-stratified, agent-based model to demonstrate that vaccination has averted 279,000 fatalities between the start of the vaccination programme and July 2021 (which is also around one half of expected fatalities in the absence of vaccines).

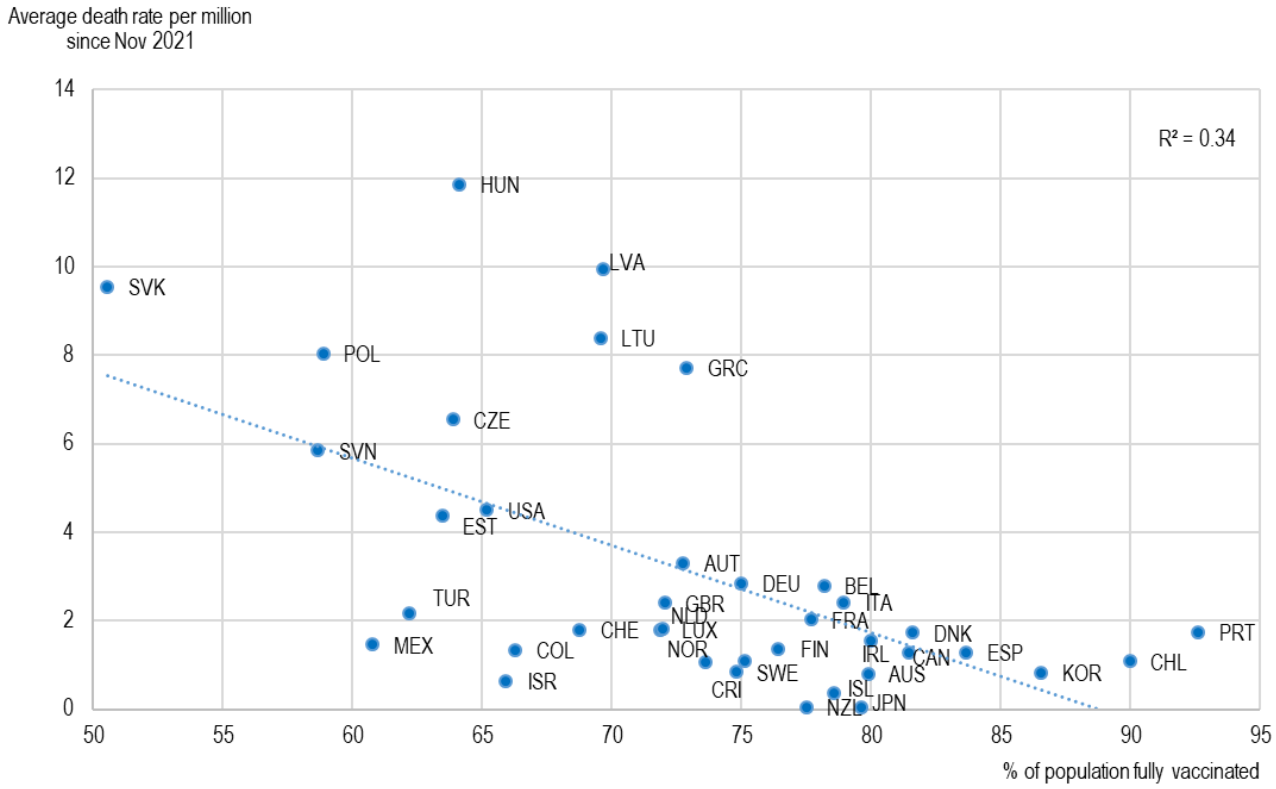
[4] For mRNA vaccines (BioNTech/Pfizer and Moderna), conservative estimates for the effectiveness are 80% (Chung et al., 2021[52]) after one dose and 93% after two doses (Tartof et al., 2021[53]; Haas et al., 2021[54]; Andrews et al., 2021[55]). The second estimate integrates the effect of waning immunity, as the protection against severe outcomes is higher than 95% up to 14 weeks after vaccination and above 90% thereafter (Andrews et al., 2021[55]). For the Oxford/AstraZeneca's vaccine, comparable estimates are 90% after one dose and 85% after two doses (Andrews et al., 2021[55]). Here, waning immunity explains the lower effectiveness of two AstraZeneca doses versus one. Finally, for Janssen Pharmaceutica NV, the effectiveness after the single dose is estimated at 85% (Sadoff et al., 2021[56]). While these estimates were based on the original variant of the virus, so far efficacy does not seem very different for subsequent variants.

- Again for the United States, (Gupta et al., 2021[4]) use a regression-based approach to determine the relationship between vaccination and fatalities and find that to May 2021, vaccination saved 140,000 lives, implying deaths would have been 1.2 times higher without vaccines.
- Using regression analysis over a large sample of 123 developing and advanced countries, (Deb et al., 2021[5]) show that a 10 percentage point increase in vaccination is associated with a reduction of deaths by 80 per million of population and COVID-related ICU admissions by 1200 per million.

3. A snapshot of the situation in January 2022 (Figure 2), provides some evidence that OECD countries with less extensive vaccine coverage have been more severely affected by the most recent wave of the Omicron variant in terms of COVID-related deaths, although the relationship is undoubtedly obscured by many confounding factors.[5]

Figure 2. Countries with lower vaccination rates have experienced higher death rates recently

Average death rate since November 2021 (vertical axis) and share of population fully vaccinated (horizontal axis).



Note: The average death rate is the average of the new deaths per million people observed between the beginning of November 2021 and the end of January 2022.
Source: Our World in Data, downloaded on the 11th of March 2022.

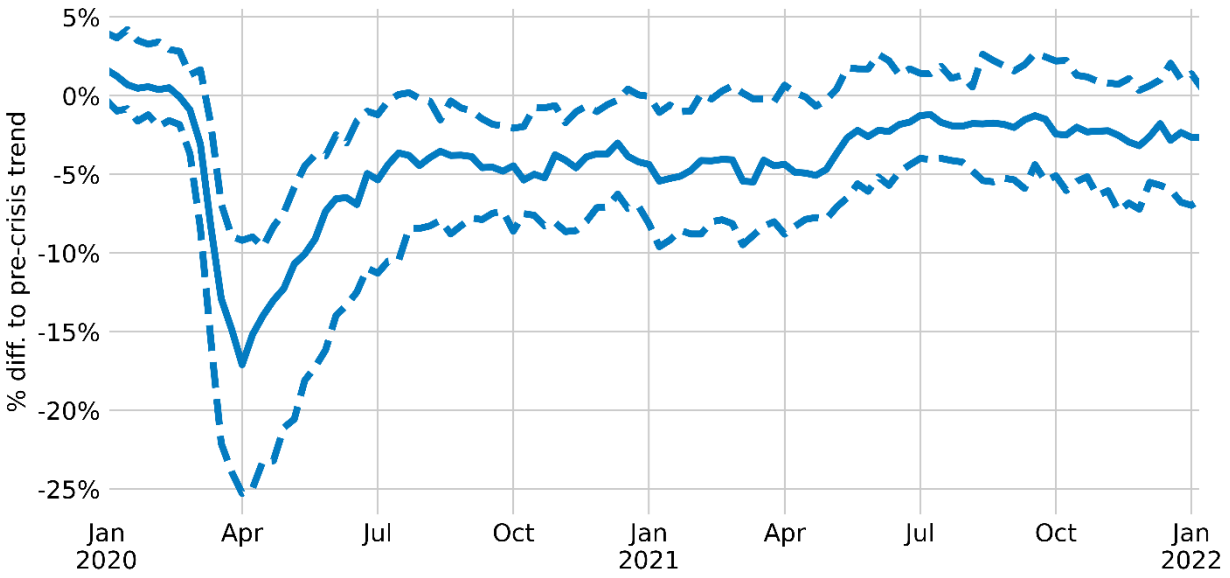
[5] Other factors possibly explaining differences in the death rate are likely to include differences across countries in the timing of waves of the virus, the extent of lockdown measures and other non-pharmaceutical interventions in place, demographic composition, capacity and effectiveness of health systems, climate, etc.

2.2. Evidence of economic benefits

4. Previous work presented to this Committee has emphasised that more extensive vaccine coverage enables lockdown measures to be progressively relaxed, while still ensuring the reproduction number (R) remains below unity (Turner et al., 2021[6]). Additionally, the perception that the virus represents a reduced risk will encourage workers and consumers to resume a more normal activity. Both effects mean that a more extensive vaccine coverage should imply, *ceteris paribus*, a more robust recovery in economic activity. Indeed, for the median OECD country, the recovery in GDP, which had stalled between mid-2020 and the first quarter of 2021, was given further impetus as the vaccine rollout gathered pace and the share of the population fully vaccinated rose from 5% to 47% from the beginning of April to the end of July 2021 (Figure 3). That said, simple cross-country evidence linking the recovery with the extent of the vaccine rollout is complicated by other confounding factors that include the different impact of macro policies, the differing exposure of countries to tourism and travel (Rusticelli and Turner, 2021[7]), as well as the different timing in waves of the virus.

Figure 3. OECD Tracker of Weekly GDP: OECD countries

Median, 10th percentile, and 90th percentile



Note: The OECD Weekly Tracker estimates weekly GDP relative to the pre-crisis trend. It uses search data from Google Trends and a machine learning algorithm.
Source: OECD Weekly Tracker (Woloszko, 2020[8])

5. Evidence that the extent of vaccination benefits the economy is borne out by more elaborate studies, that quantify the economic impact of vaccination based on time series cross-country regression analysis, while controlling for other factors:

- (Deb et al., 2021[9]) use a number of high-frequency proxies of economic activity to run two-way fixed effect regressions controlling for vaccination in trade partners and vaccination expectations over a sample of 46 countries. The use of high-frequency outcome proxies is made necessary by the fact that vaccination varies rapidly and that the response of economic activity may be non-linear, thus constraining the validity of quarterly panel models (Ghanem and Smith, 2021[10]). The authors find that an increase in vaccination coverage by 10 percentage points is associated with an increase of 30% in NO2 emissions, which are shown to be correlated with GDP. However, they stop short of converting

the effect on emissions into a corresponding GDP effect, not least because this specific marginal response is likely to be very different to the average relationship that they observe, because higher vaccination is associated with higher mobility and car use is a strong driver of NO2 emissions.

- Oliu-Barton, Pradelski and Woloszko (2021[11]) circumvent such limitations by adopting a similar statistical approach to data covering 46 emerging and advanced economies, but make use of the OECD Weekly Tracker of GDP growth (Woloszko, 2020[8]) rather than an indirect measure such as emissions. Vaccination is allowed to affect economic activity both through a direct channel, as vaccinated individuals are more likely to resume a number of economic activities, and an indirect channel through the impact on virus diffusion and government policy responses. They find that an increase in vaccination coverage by 10 percentage points is associated with an increase of ½ of a percentage point in GDP after four weeks.[6]

3. Supply constraints have been an issue until recently in a few OECD countries

6. Some countries were much quicker to procure vaccines and so took a clear lead in the vaccine rollout in early 2021 (Figure 4). By the end of April 2021, Israel (with 55% of the population vaccinated), Chile (35%), the United States (34%), the United Kingdom (22%) and Hungary (20%) were far ahead of other OECD countries where vaccination coverage ranged between 11% to less than 1% of the population. However, most other OECD countries have since caught up and among these five early leaders, only Chile remains in the highest quartile of vaccine coverage among OECD countries, whilst Hungary and the United States are now in the lowest quartile and Israel has fallen into the lower half.

7. The time profile of vaccine coverage typically follows the pattern of a logistic curve, which captures the main dynamics of a diffusion process: initially progress is slow as supplies of a new vaccine are constrained, new means of large-scale administering the vaccines have to be put in place and priority is given to the most vulnerable; progress then becomes more rapid as supplies become more readily available, logistical problems are solved and the vaccine is extended more widely across the population; finally, coverage starts to slow down and shows signs of plateauing as those that are willing and eligible have mostly been vaccinated and progress depends on persuading those that are reluctant or hard to reach. Most OECD countries now appear to be in the latter stages, with relatively slow progress in coverage recently, suggesting supply is no longer a constraint: for most OECD countries vaccine coverage has increased by less than 2 percentage points in during January 2022. However there are some exceptions, most notably Colombia (coverage has increased 6 percentage points over the last month), and to a lesser extent Costa Rica and Mexico (coverage increased 4 percentage points), which initially all experienced more protracted supply constraints than other OECD countries in terms of procuring vaccines (Figure 4) and so have been experiencing a more rapid take-up recently. Regression analysis, which controls for other factors, suggests that early supply constraints for these countries help to explain current low vaccine coverage (Annex A).

- Colombia's vaccination rollout had a slower start than regional peers largely due to initial difficulties in procuring vaccines. The logistic challenges and the prioritisation of vaccine recipients were subsequently managed well, but the slow arrival of jabs severely limited vaccine rollout. Colombia has since benefitted from vaccine donations by the United States and COVAX. Despite the strong recent

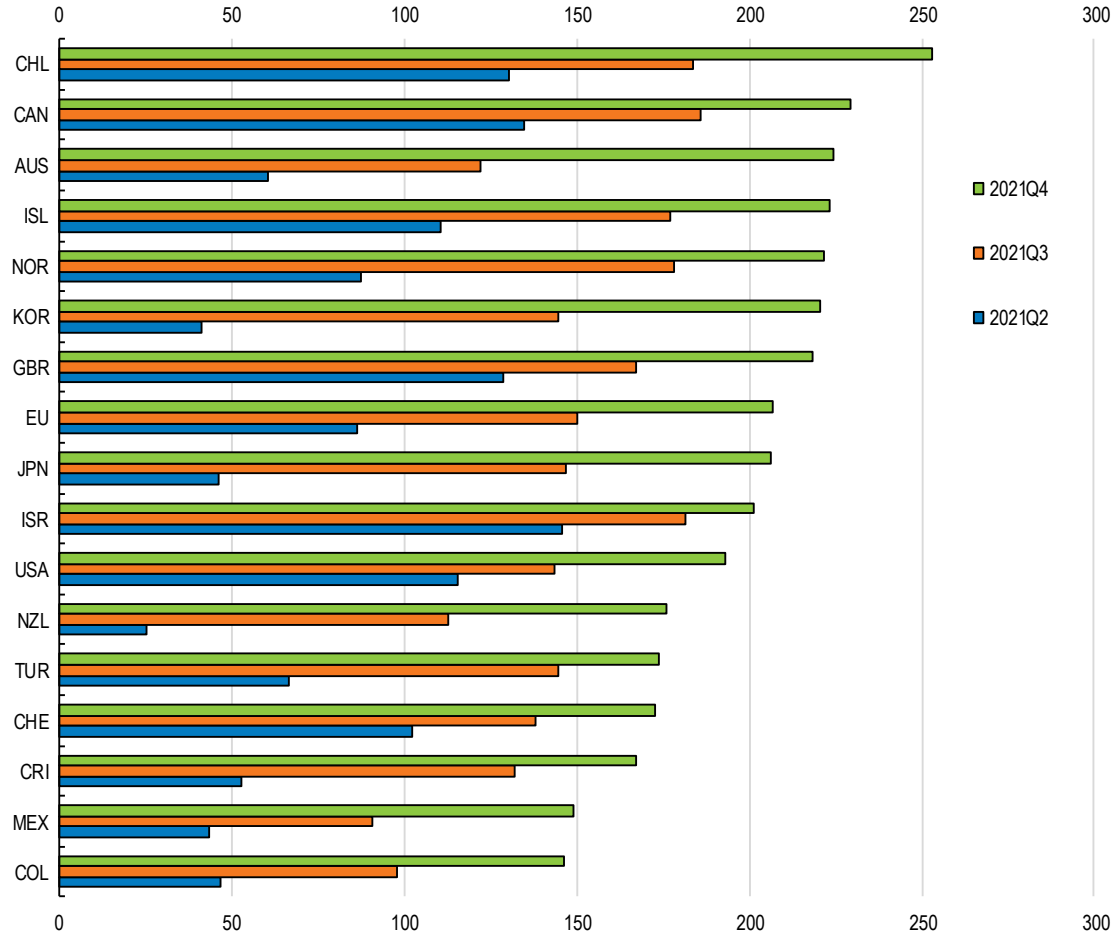
[6] This estimate controls for a number of other factors. First, the model includes country and week fixed effects, which partial out the correlation between a country's possible higher vulnerability to the virus and stronger will to vaccinate, as well as global shocks. Second, it includes lagged information that can potentially influence both lagged vaccinations and contemporaneous economic activity: the number of cases, deaths, the reproduction rate, the mobility index and the stringency index. Third, the model also controls for vaccination and health outcomes in the main trading partners, in order to disentangle the effect from vaccination abroad, which is often concomitant with domestic vaccination.

increases, vaccine coverage at the end of January was relatively low compared to most other OECD countries.

- Costa Rica also experienced initial supply constraints, and around mid-2021 was among the OECD countries with the lowest vaccination coverage. However, as supply constraints have been eased, a successful vaccine rollout has seen a rapid pickup in coverage so that Costa Rica is now above the OECD median country in terms of coverage.
- Hungary acted quickly to procure vaccines going outside the collective EU programme to purchase the Sinopharm and Sputnik vaccines, so that the initial vaccine rollout was relatively fast. This may, however, have subsequently hampered the extension of coverage, because, against a background of low levels of trust in government and the health system, the population did not readily accept the authorities' assurances that the vaccines were safe and effective. Similarly, in the Slovak Republic, confidence in vaccines was not helped by the initial rollout where mass orders of the Sputnik vaccine were made with little consultation or discussion, so that low demand led to many doses being given away, destroyed or sold back.

Figure 4. Total COVID-19 vaccine deliveries since 2020Q4

Cumulative Covid-19 doses received since 2020Q4 as percentage of total population



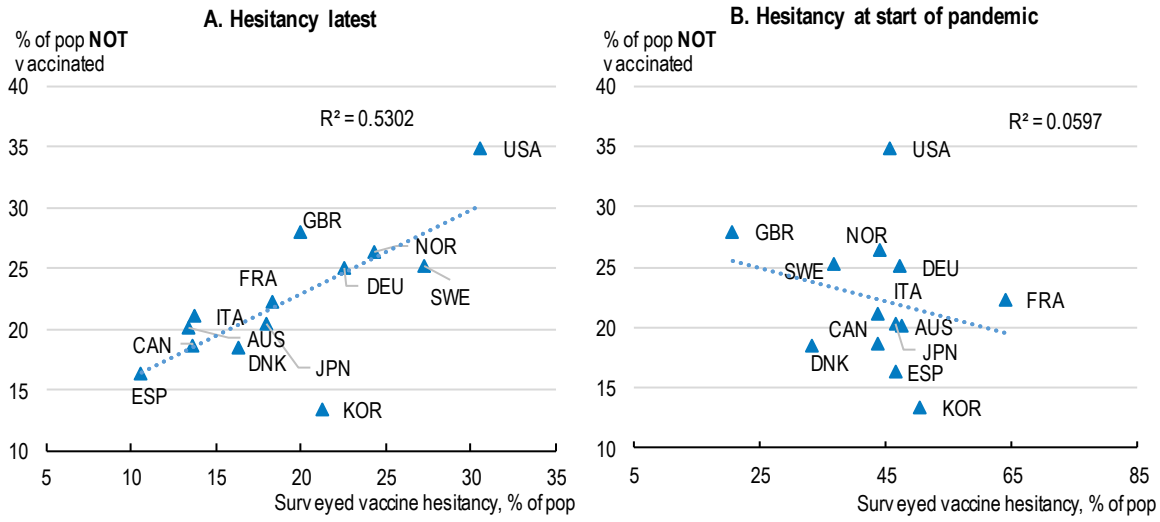
Note: The number of delivered COVID-19 vaccine doses includes vaccine doses received based on bilateral and multilateral agreements, donations, COVAX, AVAT and unknowns. Population numbers refer to 2020.
Source: UNICEF, COVID-19 Vaccine Market Dashboard.

4. Vaccine hesitancy can be overcome to some extent

8. Among a limited number of OECD countries for which the population is regularly surveyed, there is an unsurprising contemporaneous positive correlation between the share of the population that are currently *not* fully vaccinated and the share of a surveyed population who are unwilling and uncertain to consider vaccination (Figure 5, panel A). However, more interestingly, there is no such correlation between the attitudes to vaccination against COVID-19 surveyed at the *beginning of 2021* (i.e. the start of the vaccine rollouts) and the coverage of *current* vaccinations (Figure 5, panel B). The clear implication is that vaccine hesitancy is far from immutable, but rather adjusts in the face of experience and so may be influenced by policy.

Figure 5. Vaccine hesitancy at the start of the rollout is not correlated with current coverage

Share of population currently not vaccinated on vertical axis; Different survey measures of vaccine hesitancy at different dates on the horizontal axis.



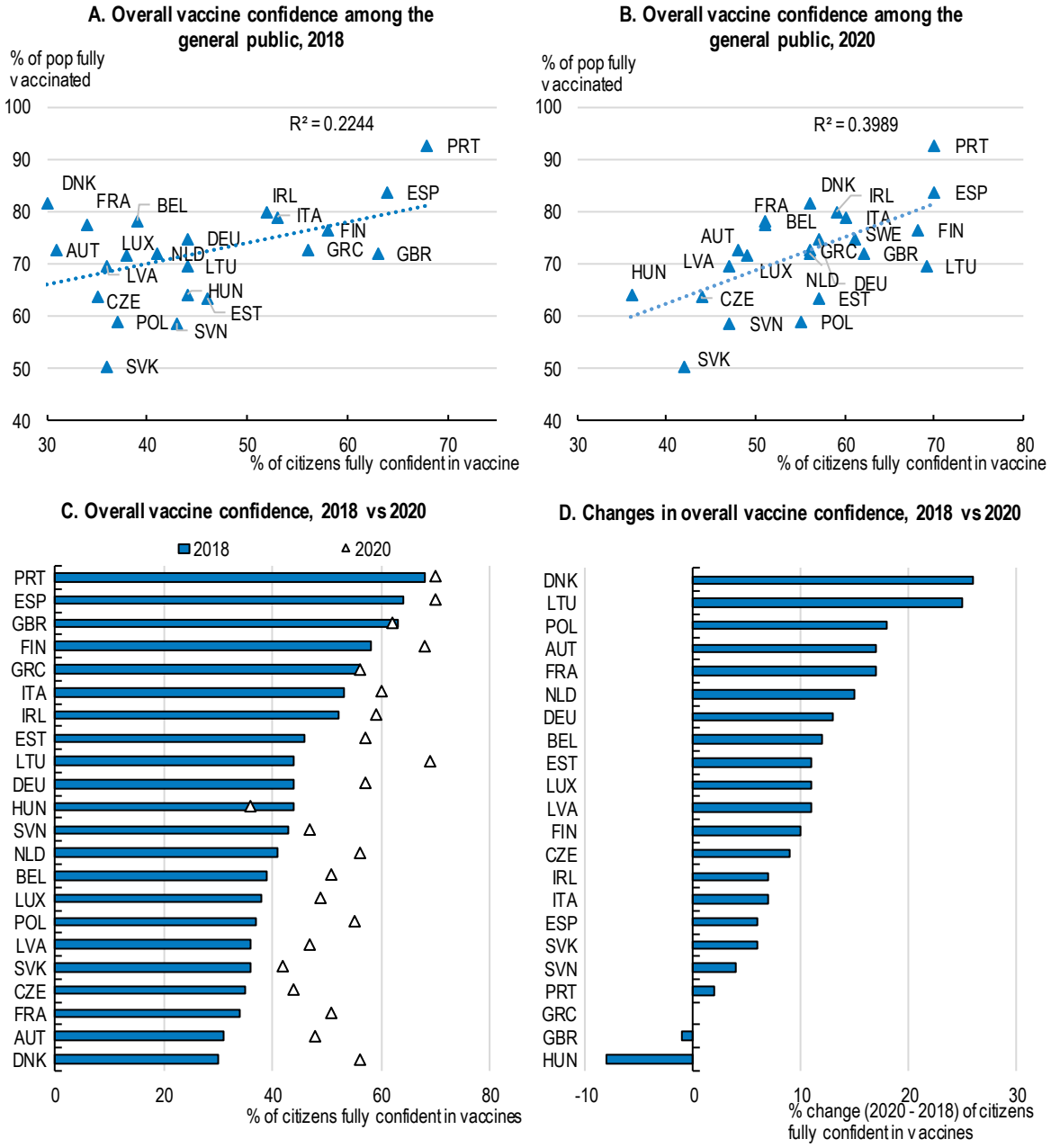
Note: In both panels, vaccine hesitancy is defined as the percentage of the population unwilling and uncertain to get vaccinated.
Source: Survey data collected by YouGov in partnership with the Institute of Global Health Innovation (IGHI) at Imperial College London, downloaded on 17th of March 2022; Our World in Data, downloaded on the 11th of March 2022.

9. This message is confirmed by data from the Vaccine Confidence Project,[7] which has been regularly surveying EU countries and the United Kingdom about attitudes to vaccination more generally (rather than vaccination against COVID in particular). While there appears to be a reasonably strong correlation between positive attitudes to vaccination surveyed in 2020 and the current extent of vaccination against COVID (Figure 6, panel B), what is more striking is how much weaker the correlation is with attitudes in 2018 (Figure 6, panel A) and how much those attitudes have changed since 2018 given the experience of the pandemic (Figure 6, panels C and D). In particular, in nearly all countries attitudes have become much more positive, with the biggest changes often in those countries that were previously the least confident. Among few exceptions are the United Kingdom and Greece where confidence either fell

[7] The Vaccine Confidence Index™ survey tool (VCI) is a battery of survey questions designed to measure populations' confidence in vaccines against a mix of sociodemographic variables.

slightly or remained the same, but from a high initial (i.e. 2018) level. The more worrying case is Hungary, the only country where confidence fell substantially from initial levels that were already quite low.

Figure 6. Attitudes to vaccination in general have mostly become more positive

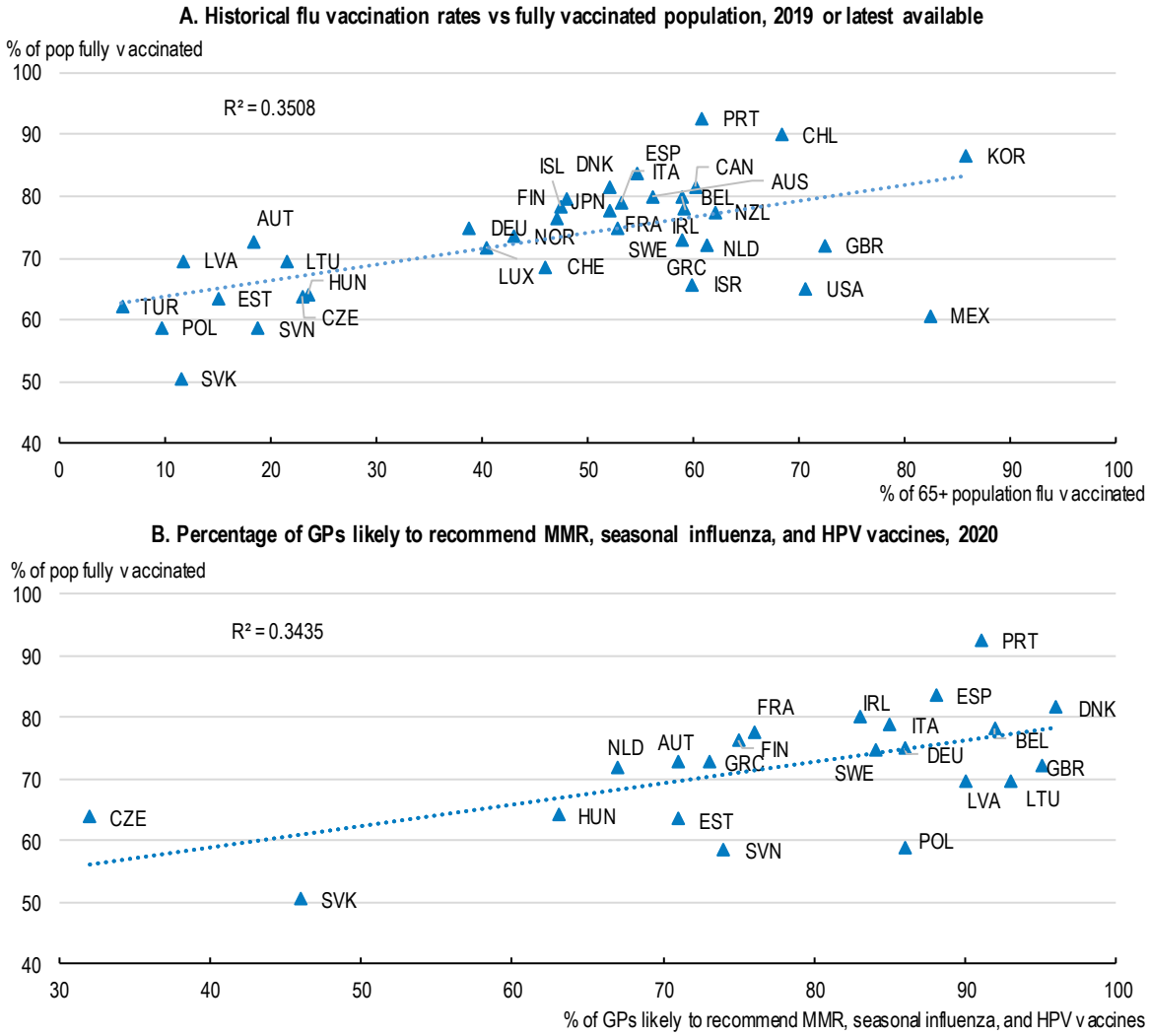


Note: In Panels A and B, the percentage of the population fully vaccinated refers to the latest available.
Source: Our World in Data, downloaded on the 11th of March 2022; Vaccine Confidence Project™, "State of Vaccine Confidence in the EU and the UK (2020)".

10. Despite evidence that attitudes to vaccination are subject to change, there is a reasonably strong positive correlation between the share of the elderly who were vaccinated against flu in 2019 and current

levels of vaccination coverage against COVID (Figure 7, panel A).[8] Although there appear to be some exceptions, many of the countries where flu vaccination has been historically low are also those where current vaccine coverage against COVID is low. Moreover, flu vaccination rates remain a reliable marker for COVID vaccination rates in regression analysis that controls for other explanatory variables (Annex A). Similarly, there is a positive correlation between the share of general practitioners likely to prescribe vaccines against other illnesses and current vaccine coverage against COVID (Figure 7, panel B). This confirms the findings of (Mishra et al., 2021[12]) that historic under-vaccination is a good predictor of vaccination against COVID.

Figure 7. Historical flu vaccination rates and GPs' attitudes correlate with COVID vaccine coverage



Note: 'MMR' stands for measles, mumps, rubella and 'HPV' for human papillomavirus. The percentage of the population fully vaccinated refers to the latest available.

Source: Our World in Data, downloaded on the 11th of March 2022; Vaccine Confidence Project™, "State of Vaccine Confidence in the EU and the UK (2020)"; OECD.

[8] Note that the country coverage in Figure 5, which suggests there is great potential to overcome vaccine hesitancy, is much smaller than in Figure 7, and the former does not include most of the OECD countries where vaccination rates are the lowest against COVID and historically against flu.

11. Many countries are facing challenges to overcome vaccine hesitancy among minorities and disadvantaged groups that typically have lower trust in government and institutions eroded by discrimination, under-representation in health research and negative experiences within culturally insensitive health care systems (OECD, 2021[13]) (OECD, 2021). For example, in Slovakia only 10% of the Roma population have been vaccinated (Hidas et al., 2022[14])(Ministry of Finance, Slovak Republic, 2022). Vaccination rates among ultraorthodox groups in Israel is only about half the rate of the rest of the population (Gorelik, Anis and Edelstein, 2022[15]). Other countries typically show much lower rates of vaccinations among ethnic minorities and deprived communities (Razai et al., 2021[16]; Pingali et al., 2021[17]; The OpenSAFELY Collaborative, 2021[18]) (Razai, 2021; CDC, 2021; Curtis, 2021). To address such differences, policies may need to be adapted to the needs of different groups. Good practices in this regard include mobile vaccination units, which make the vaccinations more accessible (Hidas et al., 2022[14]) and well-managed community engagement (OECD, 2021[13]), including making use of the example of 'champions' such as local community leaders or sporting heroes.

12. Finally, using simple cross-country correlations among OECD countries, it is difficult to detect any systematic positive relationship between the past severity of the pandemic (as measured by the peak or total death rate) and either changes in attitudes towards vaccination or the current extent of vaccination. Nevertheless, a number of researchers have attributed the severity of earlier waves in particular countries (for example in Spain and Portugal) as providing a spur to vaccination coverage (Dewatripont, 2021[19]).

5. Trust in institutions matters but the link to vaccinations is not straight forward

13. In general, 'trust in government'' is often mentioned as an important factor in persuading citizens as to the merits of new policy initiatives (OECD, 2021[13]) and so likely an important potential factor in ensuring a more extensive coverage of a new vaccine. In practice, there is surprisingly little correlation between vaccine coverage against COVID and survey evidence of trust in government among OECD countries (Figure 8, panel A) and this remains the case in regression analysis that attempts to control for other variables (Annex A). On the other hand, more specific survey evidence found that respondents who were more likely to accept a COVID vaccine were also more likely to trust their government (Lazarus et al., 2020[20]).

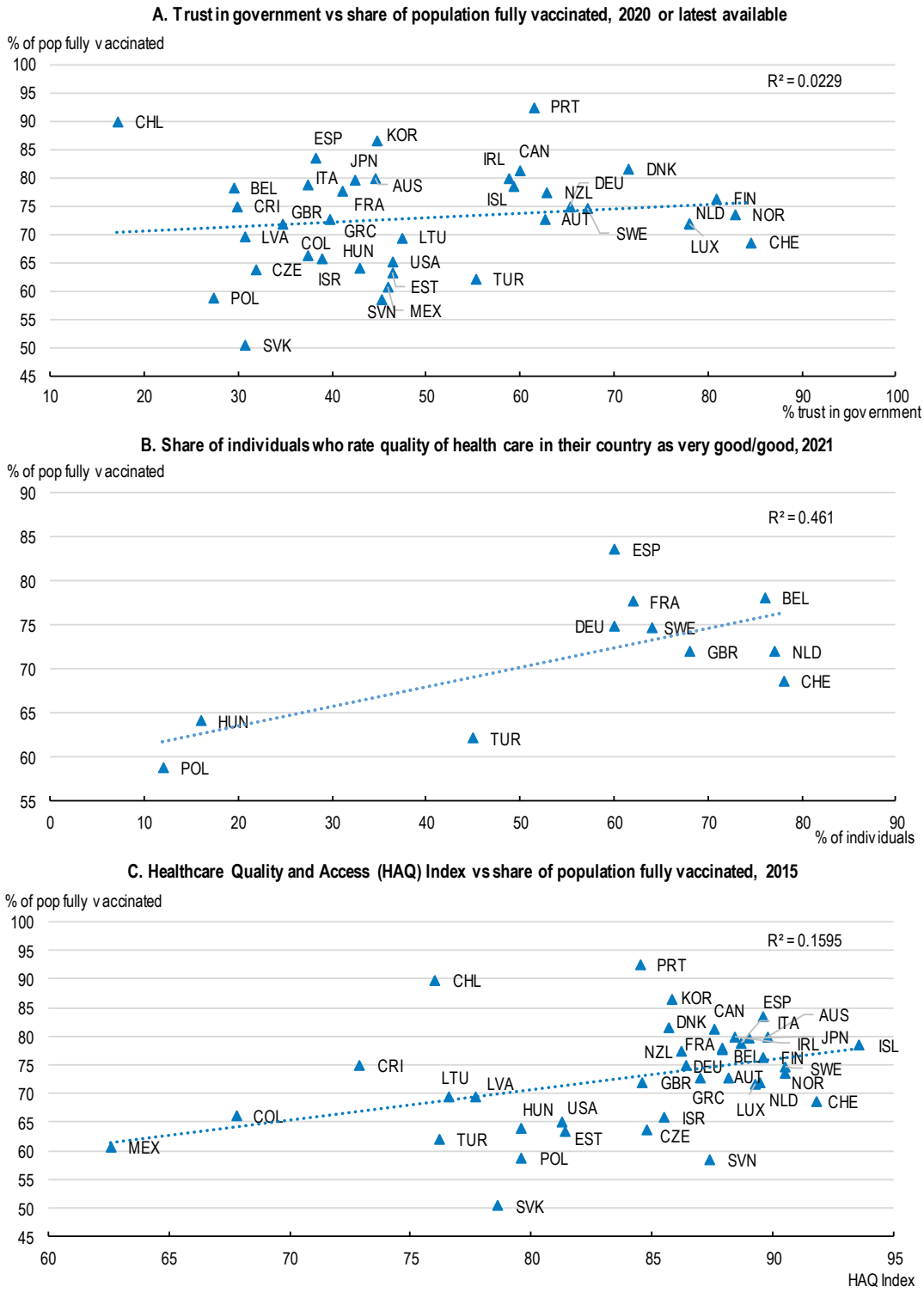
14. Of course, there are other confounding factors and it is possible that trust in government is one enabling factor, which has more traction in combination with other variables, including practical logistical arrangements. Low trust can also create vulnerabilities to other factors. For example, it appears that a weak trust in government is more likely to undermine the vaccination rollout if its merits are disputed by mainstream political parties. Thus, while the vaccine rollout had broad political support in Chile, in other countries where its merits were disputed and trust in government is relatively low, there is evidence that vaccine coverage is related to political affiliation, as for example in Poland (Wanat, 2021[21]) and the United States (Albrecht, 2022[22]; Kirzinger et al., 2021[23]). In addition, where trust in government is weak, and especially if trust in mainstream media is also weak, there is likely to be a greater vulnerability to disinformation from social media, which appears to have been a particular problem in Eastern European countries (Ghodsee and Orenstein, 2021[24]). More generally, the OECD countries with the lowest vaccination rates tend to be those where social media is used most as a source of news and trust in social media is generally higher.[9]

15. There does seem to be a stronger correlation of vaccine coverage with trust in healthcare systems, but only for a limited country sample (Figure 8, panel B). For a wider sample of countries, there appears

[9] All of the countries in the lowest quartile of vaccination rates, with one exception (the United States), are also those countries which are in the top quartile (mostly) or second quartile of OECD countries in terms of using social media as a source of news (Newman et al., 2021[1]).

to be a weaker correlation with an indicator of access and quality to healthcare, where the latter is based on death rates from 32 causes of death that could be avoided by timely and effective medical care (Figure 8, panel C). More in-depth studies, suggest that here is also some cross-country evidence that trust in scientists is a key driving force behind individual support for, and compliance with, non-pharmaceutical interventions against COVID as well as for more favourable attitudes towards vaccination (Algan et al., 2021[25]).

Figure 8. Trust and quality of health care has a stronger correlation with vaccine coverage than trust in government



Note: In Panel C, the Healthcare Access and Quality (HAQ) index is measured on a scale from 0 (worst) to 100 (best) based on death rates from 32 causes of death that could be avoided by timely and effective medical care (also known as 'amenable mortality'). In all panels, the percentage of the population fully vaccinated refers to the latest available.

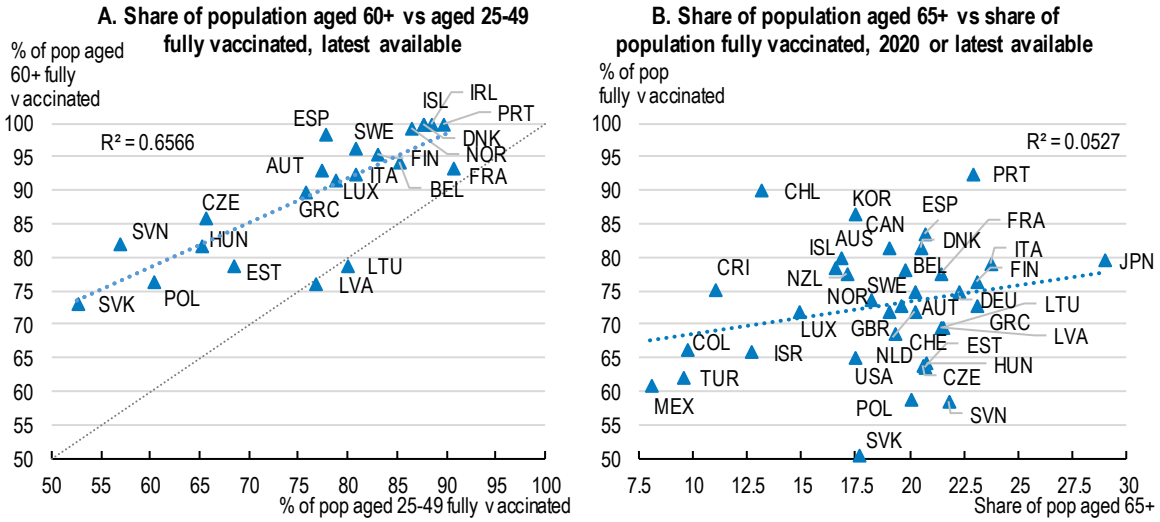
Source: Our World in Data, downloaded on the 11th of March 2022; Statista; (Algan et al., 2021[25]); Global Health Data Exchange, Global Burden of Disease Study 2015 (GBD 2015) Healthcare Access and Quality Index Based on Amenable Mortality 1990–2015; OECD.

6. Demographic factors

6.1. Vaccine coverage has prioritised the elderly

16. Risks of serious illness from COVID-19 are much greater for elderly people as mortality increases exponentially with age (Levin et al., 2020[26]; O'Driscoll et al., 2020[27]). For this reason, vaccination programmes have prioritised and targeted older people so that the vaccination rate is typically much higher among those aged over 60 compared to adults aged 25 to 49 (Figure 9, Panel A). A corollary is that those countries that have a high elderly population share tend to have a higher overall vaccination rate, as evidenced by Japan (with relatively high shares of both) as compared to Turkey, Columbia and Mexico (relatively low shares). On the other hand, the elderly population share is only weakly correlated with vaccination coverage across all OECD countries (Figure 9, Panel B) and in regressions the elderly share is not significant in explaining the total population vaccination share once other explanatory variables are included (Annex A).

Figure 9. The elderly have higher vaccine coverage



Note: The percentage of the population fully vaccinated refers to the latest available.
Source: European Centre for Disease Prevention and Control, COVID-19 Vaccine Tracker, downloaded on 17th of March; Our World in Data, downloaded on the 11th of March 2022; OECD.

6.2. Vaccine coverage of children differs widely across OECD countries

17. There is an ongoing debate as to whether children should be vaccinated against COVID-19 (Mahase, 2021[28]; Donohue and Miller, 2020[29]). On the one hand, the risk of serious illness is generally much lower for this age group; adolescents appear to be more vulnerable to some serious, albeit, extremely rare side-effects of the vaccine;[10] and there may be a reluctance to vaccinate children who may be more susceptible to any longer-term side effects from vaccines that are currently difficult to assess (Saxena, Skirrow and Wighton, 2021[30]). On the other hand, even if children are less susceptible to serious illness, once infected they will be a source of transmission to the wider community. Moreover, there are growing

[10] There have been some very rare cases of myocarditis and pericarditis reported (Kuehn, 2021[57]) (Das et al., 2021[58]) with a higher prevalence in young adults and children (Hajjo et al., 2021[61]), although no serious adverse events were reported in the main clinical trials conducted in on adolescents (Ali et al., 2021[59]) (Frenck et al., 2021[60])

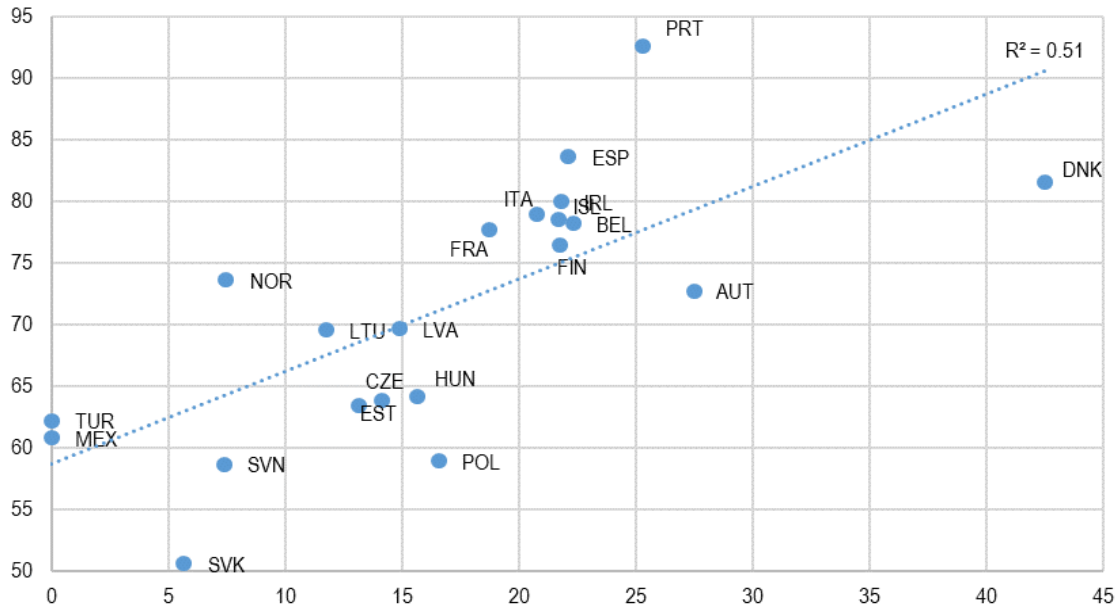
concerns about the long-term costs both to individuals and the wider macro economy of schooling time lost because of the needs to isolate (Psacharopoulos et al., 2020[31]; Fuchs-Schündeln et al., 2020[32]).

18. While comprehensive data on the share of children who are vaccinated across OECD countries is not readily available, there do seem to be major differences across countries, which help to explain differences in total population vaccine coverage Figure 10) even after controlling for other explanatory factors (Annex A). Based on an incomplete country coverage the median share of children aged 5-14 that are vaccinated across 22 OECD countries is about 17%, but with a wide dispersion around that figure:[11]

- Turkey and Mexico, as a matter of policy, do not vaccinate under 12 and under 15 year olds (at the time of writing), respectively, which helps to explain why the total population coverage is relatively low.
- Vaccine coverage of children in Eastern European countries is well below the OECD average, especially for the Slovak Republic and Czech Republic.
- Vaccine coverage of children is notably high in Denmark, which helps to explain its relatively high ranking for total population coverage among OECD countries.

Figure 10. Vaccine coverage for children differs widely and helps to explain population coverage

Vertical axis measures current vaccine coverage of the total population against COVID, horizontal axis measures the authors estimates of the share of children aged 5-14 that are vaccinated.



Note: For details of how the vaccine coverage of children aged 5-14 has been constructed see footnote 8.
Source: Our World in Data, downloaded on the 11th of March 2022; OECD estimates.

7. Well-designed vaccine passes can boost vaccine coverage

19. As vaccine supply ceased to be a binding constraint in most OECD countries, governments started conditioning access to a number social activities and professional gatherings on COVID certificates, which

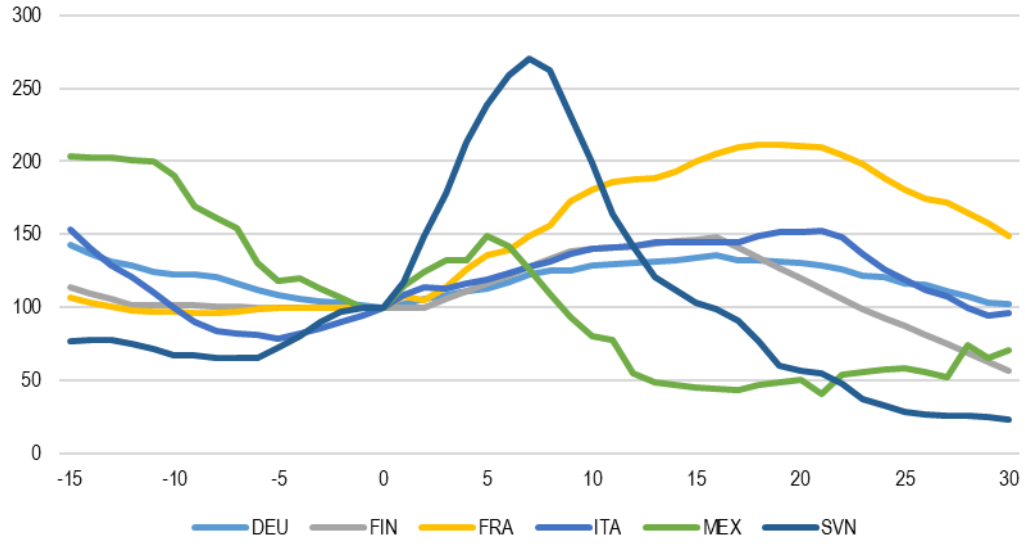
[11] To overcome data limitations on vaccine coverage, which differs in how vaccination by age groups are reported, it is assumed here that no children under 5-14 years old have been vaccinated, and that the population is equally distributed between ages 5 and 14.

certify vaccination status, recovery or a negative test, in order to foster the reopening of the economy and provide an incentive to vaccination. As many as 25 OECD countries adopted a COVID certificate between March and the end of 2021 (Woloszko, 2022[33]). Adoption accelerated during the summer as 16 countries introduced COVID certificates, especially among EU countries where the implementation of domestic COVID certificates had been facilitated by the launch of the EU Digital COVID certificate on 1 July 2021.

20. A growing body of empirical evidence suggests that COVID certificates have had a substantial impact on vaccine take-up in some of the countries where they were implemented including in France and Italy. This is consistent with simple time series evidence from a number of countries as new vaccinations seem to have substantially increased following the COVID certificate announcements in Germany, Finland, France, Italy, Mexico and Slovenia (Figure 11).

Figure 11. Daily number of people receiving their first vaccine dose per 100

Seven-day moving average, date of the COVID certificate announcement = 0



Note: The horizontal axis measures the days relative to the date of a COVID certificate announcement; the vertical axis shows the number of new people vaccinated per hundred population as an index based on the day of the announcement.

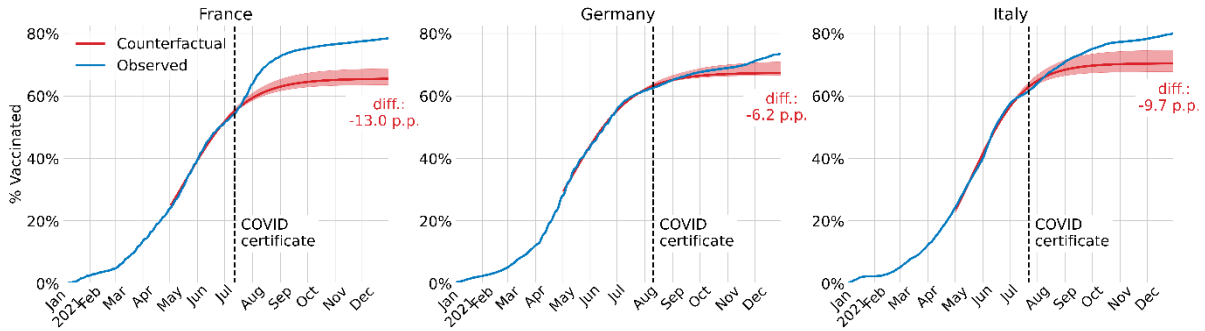
Source: Our World in Data, downloaded on the 11th of March 2022; (Oliu-Barton et al., 2021[11])

A number of studies use time-series or panel econometric methods in order to identify the magnitude of this effect to be specifically attributed to certificates:

- Karaivanov et al (2021[34]) use a difference-in-differences approach across Canadian provinces as well as time-series regression methods applied to France, Germany and Italy and find substantial estimates: around 2 percentage points in Canada; between 4.4 and 7.4 percentage points in France; around 10 percentage points in Italy; and 4.2 percentage points in Germany.
- Mills and Rüttenauer (2021[35]) apply a synthetic control method and find that the proportion of individuals with at least a first dose increased by 7.2 percentage points in France, 2.3 percentage points in Italy, but found no clear effect in Germany.
- Oliu-Barton, Pradelski, Woloszko et al. (2021[11]) use both a synthetic control approach and a logistic model inspired by innovation diffusion theory. They estimate the gains in vaccination by the end of 2021 from the implementation of COVID certificates to be 13 percentage points in France, 6 percentage points in Germany, and 10 percentage points in Italy (Figure 12). Further, they broaden the scope of

the analysis by providing an estimation of the health and economic benefits from the increased vaccination rates due to COVID certificates. First, they use estimates of vaccine efficacy to quantify the number of lives saved due to higher vaccine rates (32% of COVID-related deaths in France, 5.6% in Germany, and 14% in Italy over the second half of 2021). Second, they estimate an elasticity between vaccination rates and weekly economic activity -- computed using the OECD Weekly Tracker of GDP (Woloszko, 2020[8]) -- in order to quantify the impact of COVID certificates on GDP. The results suggest that by the end of the year, economic activity would have been lower by around a half percentage point in France and Italy and 0.3 percentage points in Germany in the absence of the COVID certificates. Last, they argue that in France the COVID certificate may have been decisive in avoiding the high pressure on ICUs that prompted previous lockdowns.

Figure 12. Estimated vaccine uptake with and without COVID certificates



Note: The cumulative proportion of the whole population who received at least one COVID-19 vaccine dose in the actual intervention deployment (blue) and in the no-intervention counterfactual scenario (red). The counterfactual scenario is built via innovation diffusion theory and further validated by synthetic control. Black dashed vertical line is the date of the introduction of the COVID certificate.
Source: Oliu-Barton, Pradelski, Woloszko et al., (2021).

21. Comparisons across countries can shed light on the drivers of success of COVID certificates:

- A comparative case study (Walkowiak, Walkowiak and Walkowiak, 2021[36]) attempts at explaining why COVID certificates had a greater impact in Lithuania than in Poland. Both countries share a common history, had similar COVID-related fatalities and similar vaccination trajectories until the summer 2021. Their vaccinations rates started diverging in July when the Lithuanian government started gradually increasing the scope of the domestic restrictions associated with the certificate, whereas Poland was, along with Spain and Sweden, among the only EU countries where COVID certificates were limited to restricting international travel. The Lithuanian certificate first restricted access to restaurants, sports facilities and indoor events, and finally banned residents without a certificate from entering supermarkets or larger shops and using most services. Until July 26, the difference between Polish and Lithuanian vaccination rates remained less than 3 percentage points, whereas by the end of October the vaccination rate in Lithuania was around 14 percentage points higher. Poland has introduced a vaccine pass, but time series evidence suggests that is has not had much effect on vaccine coverage, consistent with the personal costs it imposes on the unvaccinated being not particularly high. While from mid-December, capacity limits were set to 30% for many public venues, the limit does not apply to holders of a valid EU COVID certificate, implying that the constraint on the unvaccinated will often not be binding (and also making it more difficult to enforce and police).
- The larger estimated effects in France and Italy compared to Germany underline the role of the coverage of COVID certificates. In Germany, the COVID certificate implemented in August was made mandatory only in areas with over 35 COVID cases per 100,000 inhabitants per week,[12] whereas it

[12] https://www.bundesregierung.de/breg-en/news/federal-regional-consultation-coronavirus-1949666

was applied throughout France and Italy. The certificate was also required for a wider range of venues in France and Italy than Germany: for example, in France and Italy, but not Germany, it was required for places of entertainment and leisure (e.g. cinemas, festivals, museums, conferences, game rooms, amusement parks, cruise ships), places of social gathering (e.g. bars, cafés, restaurants, clubs) and interregional public transport (e.g. airports, train stations).

8. Mandatory vaccination

22. A majority of OECD countries have placed an obligation to be vaccinated on particular categories of workers, most obviously those involved in healthcare as well as civil servants. Thus, there are obligations to be vaccinated for: hospital staff (countries including Czech Republic, France, Germany, Greece, Hungary, New Zealand, Poland, the United Kingdom and the United States); care-home staff (including in Australia, Czech Republic, France, Germany, Hungary, New Zealand, Poland and the United Kingdom); law enforcement (including Canada, Costa Rica, Czech Republic, Italy, New Zealand, and Poland); the military (including in Czech Republic, France (for soldiers assigned to civil security missions), Italy, and New Zealand); school staff (including Italy, New Zealand, Poland, and Turkey); federal or state workers (in Canada, Costa Rica, France, Hungary, and the United States). Private companies were entitled to require vaccination from their employees in Costa Rica, and Latvia (but not in the United States following a Supreme Court ruling). In addition: France has extended the vaccine obligation to firefighters; Latvia to lawmakers; New Zealand to workers at border controls; and Turkey to domestic travel employees.

23. More recently, a few countries have introduced compulsory vaccination for all, or just older segments, of the adult population:

- In November 2021, Austria introduced stay-at-home restrictions that were initially targeted at the unvaccinated together with an announcement of future mandatory vaccination. A study comparing vaccination rates in Austria and Germany suggests that these measures may have resulted in an increase of 3 percentage points in the vaccination rate during November (Kloiber, Peichl and Winner, 2021[37]). From 5th February 2022, it became compulsory for all adults to be vaccinated. This obligation was, however, temporarily suspended on 9 March 2022, with a new evaluation scheduled to take place within 3 months. In early March, the vaccination rate for the total population was about 73%, only slightly below the OECD median, with an increase in coverage over the previous month of ½ percentage points.
- Greece will require people older than 60 years to be vaccinated against COVID-19 from January 2022. Those who refuse will be fined 100 EUR every month. Around 520,000 Greek people older than 60 years are unvaccinated. Within 24 hours of the announcement of the mandate, more than 17,500 Greek people in the targeted age group had registered to receive their first dose of the COVID-19 vaccine (Burki, 2022[38]).
- Italy announced a vaccine mandate for the over 50s backed by a sliding scale of fines that starts at 100 EUR but could rise to as much as 1,600 EUR for an unvaccinated worker over 50 who attends work in February. Over the month to mid–February, both Italy and Greece have experienced an increase in vaccination coverage of over 2½ percentage points, which is among the highest of any OECD country.
- The Czech Republic has recently announced that vaccinations will be mandatory for the over 60s from March.

24. It is too early to assess what effect mandatory vaccination has on increasing coverage and any assessment will need to be take account of the effect that such measures also have on polarising anti-vaccination attitudes.

9. Policies to 'nudge' vaccination have had mixed effects

25. A wide variety of financial and other incentives have been adopted to encourage vaccination. Most evaluations of such 'nudge' policies suggest that they may sometimes have had some positive affect in accelerating vaccination in the early phases of rollouts, but mostly did very little to reduce vaccine hesitancy:

- Two studies cover the effectiveness of the lottery system to pay randomly selected vaccine recipients announced by the state of Ohio on 12 May 2021. (Walkey, Law and Bosch, 2021[39]) use a times series method, and (Sehgal, 2021[40]) use a synthetic control approach. Both find a small effect of around 1 percentage point on vaccination rates.
- In the early phases of the vaccination campaign, studies based on survey experiments showed that a variety of public health messages could improve vaccine intentions in the United States (Ashworth et al., 2021[41]; Motta et al., 2021[42]), in the United Kingdom (Davis, Golding and McKay, 2021[43]) and Japan (Sasaki, Saito and Ohtake, 2022[44]).
- A study using randomised control trials (RCTs) in the early phase of the vaccination campaign in Sweden has shown that financial incentives were effective, as a reward of 25 USD was found to increase vaccination rates by over 4 percentage points (Campos-Mercade et al., 2021[45]). Other financial incentives include 100 USD savings bonds or gift cards in West Virginia, free beer and other beverages in New Jersey and Connecticut, and daily Krispy Kreme donuts in the United States (Volpp and Cannuscio, 2021[46]). Reminder messages, a popular nudge, were shown to be effective. (Dai et al., 2021[47]) uses large-scale RCTs from January 2021 in the United States to show that reminder messages substantially boosted vaccination rates. (Milkman et al., 2021[48]) also used an RCT conducted in autumn 2020 to show that reminder messages were boosting the adoption of influenza vaccines.
- (Chang et al., 2021[49]) test the effect of a comprehensive array of nudges: financial incentives, public health messages and other behavioural nudges using a large-scale RCT run in the United States in mid-2021. Although public health messages increase vaccine intention, none of the treatments had a positive impact on vaccine uptake. Financial incentives and negative public health messages may even have had a negative effect on some subgroups due to a "backlash effect".

10. Successful vaccination campaigns: Illustrations from a few OECD countries

26. Recognising that simple quantitative measures fall short of explaining the different experiences of OECD countries, the following section briefly describes the experience of those countries that lead the vaccine rollout and consistently outperform (i.e. systematically have large positive residuals) in a set of simple cross-country regressions designed to explain vaccine coverage using different combinations of explanatory variables (see Annex A for details).

27. **Portugal** has currently achieved a level of vaccine coverage that exceeds the 'maximum' feasible level of 86% initially estimated by the taskforce co-ordinating the rollout, given that people with certain medical conditions are not vaccinated and that an estimated 3% of the population are strongly opposed to vaccination. The task force, including military strategists, mathematicians, doctors and health ministry officials, co-ordinated a system of more than 300 vaccination centres, many based in municipals sport stadiums. An online self-scheduling system facilitated making vaccination appointments. Overall, the system administered at its peak 154,000 vaccinations per day (equivalent to about 1½ per cent of the population). Other factors that may have helped include positive memories of a successful national vaccination plan in the 1960s as well as the more recent negative experience of the peak in hospitalisations and death rates, which on a per capita basis was one of the most severe in the OECD, following the surge in cases due to the Delta variant in late 2020 and early 2021. Portugal, like many other European countries,

adopted a vaccine pass to access certain venues, but the requirements were much less strict; for example, it was applied to restaurants, but only at the weekend and in regions with a high incidence. For this reason, and because the vaccine rollout already had considerable momentum, it is difficult to identify any immediate time series effect on vaccine coverage from the introduction of the vaccine pass.

28. **Chile** had a rapid vaccination rollout, especially compared to regional peers, because the authorities acted early to purchase sufficient supply of vaccines. Quick vaccination procurement was a policy priority, and had unanimous and unconditional policy support from the outset. However, although they acted early, the authorities initially relied on the Sinovac vaccine, which does not seem to offer as effective protection against new variants, although this does not appear to have undermined confidence in the subsequent extension of the vaccination programme. Additional supply of vaccines was secured as academic institutions partnered with laboratories to perform clinical trials in the country. There was already a high level of public trust and awareness of the benefits of vaccines. This can be traced back to the National Immunization Program established in 1978, which has resulted in vaccination programmes having high adherence. For example, the influenza vaccine for the elderly currently has one of the highest coverages of any OECD country. The national and local authorities combined effectively to ensure the efficient implementation of the COVID vaccine rollout, which sustained one of the highest level of jabs per capita of any OECD country. This was facilitated by a strong tradition of community-based health care, which served as a platform for the deployment of vaccines. An estimated 6,000 health professionals were available daily for vaccination, exceptionally supplemented with dentists and midwives, which took place in health centres, schools, parks, sports facilities, streets and parking lots.[13]

29. **Korea** started its vaccination rollout relatively late, although it accelerated rapidly from late May 2021 and currently has one of the highest vaccine coverages in the OECD. A number of factors contributed to this performance:

- The use of information technology made an important contribution to the speed of the rollout. In late May 2021, when the supply of vaccines was limited, Korea launched the 'residual vaccine reservation service' on two major online platforms, which allowed people to make a real-time reservation and be vaccinated with leftover vaccines in the event of "no-shows". The launch was effective with nearly ten thousand people receiving leftover vaccines in less than five days, and contributed to a boost to the rollout.
- A relatively strong nationwide health infrastructure played a role. Korea is highly compliant with health orders; for example, the influenza vaccination rate for seniors (a strong cross-country marker for COVID vaccination) was the highest in the OECD in 2019.
- Korea introduced a vaccine pass only very recently (in mid-December 2021), although it seems unlikely that it has contributed much to increase vaccine coverage and the policy has proved controversial and may be discontinued. Instead, Korea's incentive measures have been more focused on easing some restrictions on private gatherings, such as allowing fully vaccinated people to hold larger family gatherings and private events.
- The introduction of paid vaccine leave may have been particularly important in Korea, given the reluctance to take annual leave for social/cultural reasons.
- To tackle disinformation and maintain public awareness, the Korean authorities frequently provided the public with updated information through platforms and social media. The initial success in containing the pandemic during 2020 may also have strengthened public trust.

30. **Japan** had a relatively slow vaccine rollout compared to most OECD countries, partly because vaccines were selected under strict safety standards. However, this caution likely avoided some of the

[13] This discussion draws on (Castillo, Villalobos Dintrans and Maddaleno, 2021[62]), which provides further details of the vaccine rollout in Chile.

concerns raised by adverse reactions seen in other countries and so improved confidence in the vaccines and may ultimately contributed to a more extensive vaccine rollout. Central and local governments accelerated the vaccination rollout through the implementation of large-scale vaccination centres. Japan also has a high elderly share in the population, which given the increased risk of serious illness from COVID likely pushed up vaccination rates, including among their families and immediate communities.

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Annex A. Simple cross-section regressions to explain current vaccine coverage

This annex reports the results of some simple cross-section regressions to explain vaccine coverage across all OECD countries in early March 2022 (Tables A.1 and A.2). Given that they are based on only 38 observations of the dependent variable the results should, at best, only be interpreted as suggestive.

- The dependant variable is the share of population who received a full vaccination scheme, sourced from Our World in Data (extracted on the 11th of March 2022).
- Separate regional dummies are defined for OECD countries in Eastern Europe, Southern Europe, Northern Europe, North America, Latin America and other Asia-Pacific countries.
- The "trust in government" and "rule of law" sources are respectively OECD *How's Life* report (OECD, 2020[50]) and World Bank Governance Indicators database.
- The share of people over 65 vaccinated for influenza is for 2019, or latest year prior to 2019, and comes from the OECD *Health at a Glance* report (OECD, 2021[51]). Data for Colombia and Costa Rica are not available.
- Given inconsistent and incomplete data regarding the vaccination coverage of children, the vaccination rate among children aged 5-14 is computed using *Our World in Data* series under the assumption that no child under five years is vaccinated, and that the population is equally distributed between the ages 5 and 14.
- The share of the population aged over 65 comes from Eurostat and United Nations population databases.
- The supply constraint proxy is a dummy for countries that both had a slow start in their vaccination rollout and are only recently catching-up. It applies to countries which are both in the lowest quartile of vaccination share in June 2021 ("slow starters") and also in the first quartile in terms of recent catch-up (this catch-up being defined as the monthly change during January 2022 relative to the average monthly change over July-December 2021). Defined in this way, the three countries for which the supply constraint dummy applies are Colombia, Costa Rica and Mexico.
- Other variables not reported here have been tested without finding significance or improving the fit of the regression. These include the peak death rate from COVID-19 before the second or third quarter of 2021, alternative government effectiveness measures and the type of vaccine.

The main findings from the regressions are as follows:

- Dummy variables for different regional country grouping were tried in different combinations, but the only grouping where the coefficient on this dummy is consistently statistically significant is that for Eastern European countries (Hungary, Poland, Czech Republic, and Slovak Republic), and implies lower coverage of between 8 and 16 percentage points.
- Various measures of "trust in government" were always insignificant and often "wrongly" signed (i.e. negative). An alternative World Bank measure of "rule of law" is found to have explanatory power in some regressions.
- The share of elderly vaccinated against influenza (in 2019) is consistently a reliable marker of vaccine coverage against COVID, even after controlling for other variables.

- Differences in the coverage of children age 5-14 have strong explanatory power in all regressions explaining total population vaccine coverage.
- The share of the population aged over 65 appears to have some positive effect on vaccination coverage, but not when included with other explanatory variables.
- The proxy measure for supply constraints is significant and has the expected (negative) sign when there are few other explanatory variables, and implies lower coverage of between 6 and 14 percentage points.
- Finally, perhaps of equal, or even greater, interest are the countries that are consistently outliers (i.e. have the largest residuals) across all regressions:
    - In all regressions, Chile, Korea and Portugal have positive residuals of about 10-15 percentage points, i.e. they consistently over-perform in terms of vaccine coverage on all combinations of explanatory variables used. Spain and Canada are following behind with positive residuals between 5 and 10 percentage points.
    - In all regressions, Slovenia and the United States have negative residuals of about 10 percentage points, i.e. they consistently under-perform on all combinations of explanatory variables used.
    - Finally, using this same metric, all the Eastern European countries would be large under-performers but for the inclusion of the regional dummy.

Table A.1. Explaining current vaccine coverage of the total population among OECD countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Dummy Eastern European countries	-15.13***						-12.47***	-13.09***	-9.22**	-15.67***	-15.82***	-7.65**	-8.23**
Child 5-14 coverage, deviation from median		0.75***					0.66***					0.44***	0.45**
Rule of law			5.31**					3.93**					-1.33
Flu vaccinated share, 2019				0.25***					0.19***			0.19***	0.20***
Share of pop 65+					0.44					0.52*			0.15
Proxy supply constraint						-5.98					-7.79*	-13.10*	-14.37*
Adj r2	0.25	0.34	0.14	0.33	0.02	0.00	0.50	0.32	0.39	0.29	0.28	0.63	0.61
Constant	74.49***	72.85***	66.72***	61.33***	65.09***	73.37***	74.16***	69.70***	65.39***	65.27***	75.18***	65.32***	63.93***
Obs	38	38	38	36	38	38	38	38	36	38	38	36	36

Note: Statistical significance at the 10%, 5% and 1% level are denoted by "*", "**" and "***", respectively.
Source: Authors calculations.

Table A.2. Summary statistics of variables used

	Fully vaccinated share of population	Rule of law	Flu vaccinated share, 2019	Share of children aged 5-14 vaccinated (deviation from median)	Population share above 65
Maximum	92.59 (PRT)	2.08 (FIN)	85.80 (KOR)	25.89 (DNK)	28.40 (JPN)
Minimum	50.55 (SVK)	-0.67 (MEX)	5.90 (TUR)	-16.61 (MEX, TUR)	7.62 (MEX)
Median	73.24	1.35	52.00	0.00	18.87
Standard deviation	9.07	0.69	21.48	7.19	4.35

Source: Authors calculations.

Analysing the share of the adult population that have been vaccinated

The empirical analysis in the main paper as well as the regression results used in this Annex all use the percentage of the total population vaccinated against COVID. Arguably, a more informative variable to try explain is the percentage of the population that the authorities have targeted for vaccination, which might

be better approximated by the percentage of the adult population vaccinated. The percentage of the adult population vaccinated might also give a better idea of the relative performance of countries because, as highlighted in the main paper, official approaches to the vaccination of children differ widely across OECD countries. Unfortunately, exact data on the vaccination rates of the adult population is not readily available in a comparable way across all OECD countries and so for this reason the main paper focuses on explaining the variable (the percentage of the total population) that is more precisely measured.

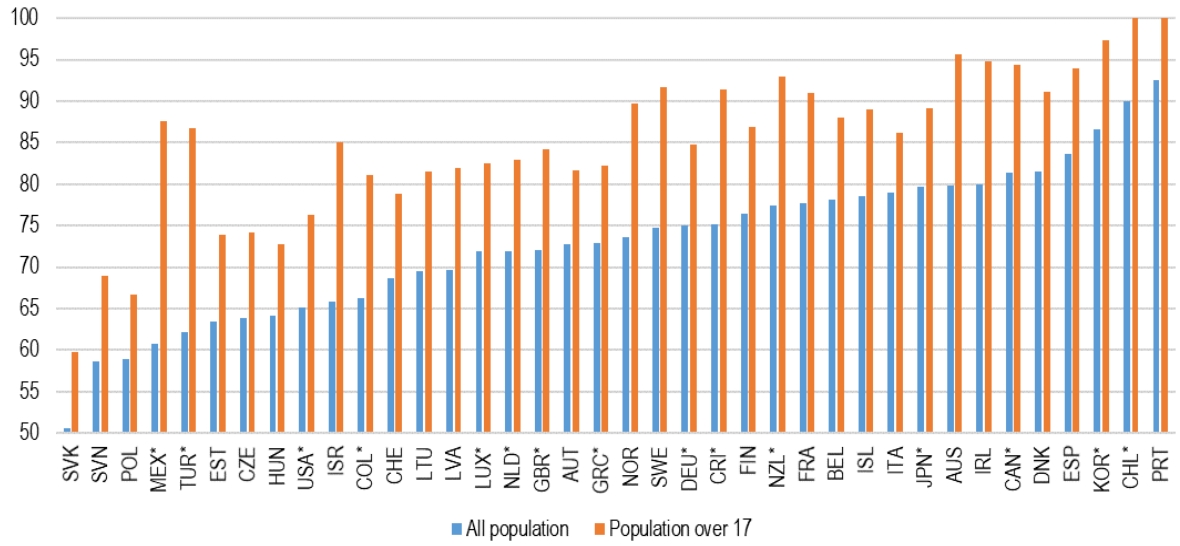
It is, however, possible to construct a proxy measure of the percentage of the adult population that are fully vaccinated by making a number of assumptions, as follows:

- For the 23 countries where detailed vaccination share by age groups are available, those shares are matched with population by age series to compute the 5 to 17 years old and over 17 years old shares, using simple assumptions when the age groups do not match the vaccination share age groups (e.g. dividing the 15-19 years old population by two to obtain 15-17 and 18-19 years old population); the vaccination rate of those aged 0-4 years old is assumed to be 0%.
- The assumption is made for Turkey and Mexico that the share of 5-17 years old who received a vaccination is 0%. For the others countries in the sample, the vaccination share of this age group is set to the median of the available countries (25.8% at the latest reading). This means that for these countries (highlighted with an asterisk in Figure A.1) the data for the share of the adult population vaccinated should be regarded as approximate and treated with caution.

Using this alternative measure, the ranking of countries with available data is broadly similar for most countries between the share of the total or adult population vaccinated (Figure A.1) with the following exceptions:

- Countries which improve ranking by at least 7 positions using the adult share are: Mexico (+18), Turkey (+15), Sweden (+9) and Israel (+8);
- Countries which decline in ranking by at least 7 positions using the adult share are: Italy (-10) and Austria (-7);

Figure A.1. Comparing recent vaccination rates for the adult and total population



Note: The data for vaccination rates for the adult population are constructed by the authors as described in the main text. Those countries marked with an asterisk are based on the crude assumption that vaccination rates for those aged 0-17 are the same as that for the median country for which data is available and should therefore be treated with particular caution.
Source: Our World in Data, downloaded on the 11th of March 2022; OECD estimates.

Repeating the regression results reported in Table A.1, the results are broadly similar (Table A.3), with the Eastern European countries dummy and flu vaccination share explaining most of the variation, and a smaller or insignificant effect of the percentage of children vaccinated. The limited coverage of detailed data of vaccination by age group – only 23 countries with actual information, while 15 countries use estimates – may explain the lower explanatory power of the regressions using the adult population.

Table A.3. Explaining current vaccine coverage of the adult population among OECD countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Dummy Eastern European countries	-18.84***						-17.63***	-18.25***	-12.41**	-18.68***	-18.88***	-11.90**	-12.39***
Child 5-14 coverage, deviation from median		0.43**					0.30*					0.18	0.27
Rule of law			3.04					1.12					-1.11
Flu vaccinated share, 2019				0.29***					0.20***			0.19***	0.19***
Share of pop 65+					-0.25					-0.15			-0.36
Proxy supply constraint						1.62					-0.53	-3.00	-7.26
Adj r2	0.40	0.09	0.03	0.43	-0.01	-0.02	0.43	0.39	0.56	0.38	0.38	0.56	0.56
Constant	87.18***	85.16***	81.65***	71.92***	89.64***	85.10***	87.02***	85.80***	77.38***	89.86***	87.22***	77.59***	86.06***
Obs	38	38	38	36	38	38	38	38	36	38	38	36	36

Note: Statistical significance at the 10%, 5% and 1% level are denoted by "*", "**" and "***", respectively.
Source: Authors calculations.