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Shortall, Ruth; Mouter, Niek; van Wee, Bert

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COVID-19 and transport. A review of factors of relevance to the design of measures and their effects worldwide

Ruth Shortall¹

Transport and Logistics Group, Delft University of Technology, Netherlands.

Niek Mouter²

Transport and Logistics Group, Delft University of Technology, Netherlands.

Bert van Wee³

Transport and Logistics Group, Delft University of Technology, Netherlands.

The COVID-19 pandemic has led to the introduction of transport-related policy measures worldwide. In this paper, we review the literature on factors that are important for the design of those measures, and their effects on safety, physical and mental health, economy and environment. We conclude that factors underlying the introduction of transport related measures are related to the broader discussion on COVID-19 measures (e.g. on social distancing). This makes it impossible to determine the independent influence of determinants aimed at transport on the effects (virus spread, economy, well-being). Furthermore, the effects of measures appear to differ strongly between countries. Important determinants for these effects are (1) socio-economic factors, (2) cultural factors, (3) political factors and (4) individual factors. In addition, the extent to which people can work at home appears to be very important for the introduction and effectiveness of COVID-19 measures. In the category of 'cultural factors', the degree to which people have a 'sense of civic responsibility' and trust in the government and institutions plays a major role in the compliance with advice and coercive measures. Furthermore, experiences with previous viruses appear to have made a positive contribution to COVID-19 policies that are successful at containing the virus. Finally, individual factors play a role in the compliance with COVID-19 measures. For example, a pro-social attitude is associated with better compliance. And: if people rate the effectiveness of such measures higher, they are more likely to act on them. The paper also provides recommendations for policy and further research.

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¹ A: Jaffalaan 5, 2628BX Delft, The Netherlands E: me@ruthshortall.com

² A: Jaffalaan 5, 2628BX Delft, The Netherlands E: n.mouter@tudelft.nl

³ A: Jaffalaan 5, 2628BX Delft, The Netherlands E: g.p.vanwee@tudelft.nl

1. Introduction

The COVID-19 pandemic poses a great challenge to the transportation sector, particularly passenger transport modes. In the aftermath of each wave of the virus, governments come under pressure to reopen schools and businesses and phase out movement restrictions. However, we lack experience with containment measures and their impacts. It is not clear whether we can apply the same measures to contain COVID-19 as were used to contain past epidemics like SARS, due to its unique characteristics (Imai et al., 2020; Wilder-Smith et al., 2020). Most countries around the world have implemented a combination of policy measures which impact transport systems in some way (Dunford et al., 2020). These policy measures aim to reduce contagion in different ways, on either the demand or supply side, e.g. by persuading people to travel less (demand) or by reducing activities or travel options (supply). These policy measures have seen varying levels of success in containing the virus.

Past experience shows that outcomes of measures affecting travel behaviours are not always predictable and may have undesirable or unexpected socioeconomic impacts. Countries such as South Korea (Zastrow, 2020) or Vietnam (Jones, 2020) managed to achieve relatively low transmission rates, whereas other countries did not, while apparently applying similar policies.

Countries and cities have implemented transport-related measures without even a basic understanding of the effects on propagation risks, economic and social consequences, and effects on people's well-being, whereas needs for such insights exist (Hale et al., 2020; Pan et al., 2020; Sung & Monschauer, 2020). In another paper (Shortall et al., 2021) we aimed to address those needs, by reviewing the literature that was available up to the end of 2020, however, we found it extremely difficult to reach conclusions about which measures are desirable or not, and in which context. We discovered that contextual factors also influence measures and their effects. For instance, we found that transport-related measures seem to be less effective at containing the virus and have more adverse social or economic effects in poorer and less developed countries. There is hence a need to understand further these underlying contextual factors. In this paper therefore, we aim to address this need and shift the scope of the review to the determinants underlying the measures and their effects.

As with the review of policy measures and effects, many papers will follow, and many new insights are bound to emerge in the coming years. Therefore, we explicitly give only an intermediate view. As in Shortall et al. (2021), we again limit ourselves to passenger mobility and focus on the modes of transport plane, car, bus, tram, metro, bicycle and walking.

Based on the literature found and analytical thinking, we created Table 1, reproduced from Shortall et al. (2021), which provides a categorisation of measures and impacts. Because travel behaviour is strongly related to activity behaviour, and policy makers have tried to limit the spread of the virus via activity related measures, we also include these activity related measures in Table 1. In addition we included generic measures that also apply to people travelling, such as keeping distance (in public transport). Table 1 makes it clear that we can classify measures into those that make people travel less, those that influence the choice of transport mode, and those that aim to reduce the spread of the virus of people travelling by public transport. The core of the policy challenge is to reduce the spread of the virus via (activity and) travel behaviour on the one hand, and avoid too much loss of accessibility and consequently physical and mental health, and economic effects. But policy makers have more goals, including goals in the area of safety and (environmental) sustainability, and the policy measures could have effects on indicators related to these goals. Therefore, we include all these policy goals in Table 1, and we categorise policy measures according to the most common policy goals we found in the literature, i.e. the social goals of physical/ mental health or safety, and the goals of economic health and environmental sustainability. The effect or impact of some measures in relation to these goals can be positive or negative. For example, some people may find working from home more pleasant than working on site (e.g. because they spend less time travelling), but others may find it unpleasant (e.g. because they miss out on social

contacts, or are less able to work undisturbed at home). Note that some of the impacts included in Table 1 are very relevant for policy makers, but they often do not necessarily formulate these impacts in terms of goals, subjective well-being being an example. But, because policy documents also generally refer to the need to ensure well-being, the quality of life, etc., we do include such impacts in Table 1.

This paper therefore starts from that table, and reviews the literature for the underlying explanatory factors (i.e. socio-economic factors, cultural factors political factors, and individual characteristics and perceptions). Section 2 describes the methodology of selecting sources. Section 3 presents the results. Finally, section 4 provides a synthesis, discusses policy relevance and suggests future research.

Table 1. COVID-19 transport-related measures and their impact on common policy goals

Strategy	Impact on policy goals			
	Physical health and safety	Mental health	Economic effects	(Environmental) Sustainability
Avoid (public and shared transport)				
Require closure of non-essential services	Reduced transmission of virus / lives saved	Lower subjective well-being and life satisfaction levels	Job/income loss Business losses Student disadvantage Online business growth	Lower GHG emissions and energy use
Request for tele-activities (e.g. work from home, teleconferences, etc.)	Less health damage from air pollution, accidents, noise	Higher/lower subjective well-being and life satisfaction levels Higher social inequity	Reduced /increased productivity Income loss	Lower GHG emissions and energy use Higher household energy use
Travel restrictions (e.g. stay-at-home requests, travel restrictions, travel ban, curfew)	Reduced transmission of virus Less health damage from air pollution, accidents, noise, but reduced physical health from inactivity	Lower subjective well-being and life satisfaction levels Increased psychological distress	Job/income loss Business losses Online business growth Economic segregation	Lower GHG emissions, energy use and noise pollution Higher household energy use
Shift (from public or shared transport to other modes to compensate lost capacity)				
Promote micro-mobility (e.g. increase capacity of bike or scooter sharing; reallocate street space)	Less transmission of the virus, and therefore less damage to health Less damage to health due to air pollution, noise More or less accidents	Higher subjective well-being and life satisfaction levels	Losses for the transport sector, especially public transport, Benefits for travellers through additional possibilities for travel	Lower GHG emissions, energy use and noise pollution
Promote active transport (e.g. expand bike lanes, reduce speed limit)	Less transmission of the virus, and therefore less damage to health			

	Health benefits through more exercise			
	Less damage to health due to air pollution, noise			
	More or less accidents			
Improve (quality and safety of public and shared transport)				
Ensure adequate social distance space in public transport (e.g. maximum number of passenger per vehicle; clearly mark passenger spacing requirements in vehicles/ stations / stops)	Reduced transmission of virus	Reduced psychological distress	Maintain essential functioning of economy Increased costs	Lower GHG emissions and noise pollution
Improved hygiene (e.g. disinfection, facemasks)				
Capacity Management (e.g. advanced ticket purchase, staggered access Increased frequency of public transport via popup bus lanes; additional fleet)				

2. Method

The methodology is similar to that of Shortall et al. (2021). We make use of scientific and grey literature (grey literature refers to non-reviewed publications, but still solid research; in the Netherlands, reports by Koninklijk Instituut voor de Marine (KiM) and Planbureau voor de Leefomgeving (PBL) are good examples of this). In addition, we used scientific databases. We searched for scientific literature in SCOPUS and Google Scholar, and for grey literature between June 9th and Oct 1st 2020. We used the following search strings:

1. 'Covid 19' OR 'covid19' OR 'COVID-19' OR 'coronavirus' OR 'SARS-CoV-2'.
2. Measures' OR 'response(s)' OR 'roadmap' OR 'intervention' OR 'strategy' OR 'strategies' OR 'transition' OR 'recovery' OR 'policy' OR 'policy response' OR 'phase-out' OR 'phase-out strategy' OR 'exit strategy(ies)'; OR 'lifting restrictions' OR 'phased lifting';
3. Transport' OR 'transportation' OR 'mobility
4. Impact' OR 'behaviour' OR 'travel behaviour' OR 'perceptions'; OR 'transport' OR 'mobility'; OR 'mobility'; OR 'impact' OR 'behaviour' OR 'travel'.

In each case, we searched for a combination of two or more of these strings. We further searched for grey literature using the Google IGO (international governmental organisation) search engine.

Primary sources were: European Commission/EU sites, UNECE, ITF (international transport forum), IRU, IMF, ILO (International Labour Organization), ICAO (International Civil Aviation Organization), IEA (International Energy Agency), EuroControl, IATA, UNCTAD, UN-Habitat, UN-WTO. Furthermore, we searched official public websites of various countries. Furthermore, we consulted databases with COVID-19 measures, such as ACAPS (ACAPS, 2020), Oxford OxCGRT (Hale, Webster, Petherick, Phillips, & Kira, 2020), European Commission (Commission, 2020), IRU (IRU, 2020), ITF (ITF, 2020), and Covid Mobility Works project (Works, 2020).

Most of the literature we found concerned the period of the first wave. A more extensive version of our methodology is provided by Shortall et al. (2021).

3. Results: factors of interest for the design of transport related measures and responses

3.1 Overview

The literature indicates that various local and regional factors play a role in the determinants of introduction and effects. Examples include specific epidemiological factors such as the actual spread of the COVID-19 virus, population density (Wright et al., 2020), economic factors such as the overall level of economic development, health care characteristics, and infrastructure characteristics. Such factors, above all, influence the goals underlying the policy. Factors that we encountered in the literature that influence the introduction of measures and their effects are socio-economic factors, cultural factors political factors, and individual characteristics and perceptions; we will deal with these four clusters in more detail in the sections below.

First, we give a brief picture of differences between countries when it comes to the introduction of transport related measures, and underlying factors. In Germany, COVID-19 measures were initially seen as a success at containing the virus, with as explanatory factors being the well-developed health system, a culture in which people have relatively few personal contacts (compared to other countries), and possibly even genetic factors playing a role (Platteau & Verardi, 2020). However, the measures are said to be less pleasant for citizens, and have even been criticised for their 'one-size-fits-all' character, which has led to them being perceived as too strict in parts of Germany that were less severely affected by the pandemic (Berlemann & Haustein, 2020). Moreover, Germany is said to be one of the European countries in which government measures aimed at COVID-19 are least accepted by the population (Sabat et al., 2020).

In Shortall et al. (2021) we indicated that measures aimed at travel restrictions had a relatively high impact in less developed countries. However, they have proven less effective in limiting the spread of COVID-19 virus. Factors that have contributed to this are the higher level of corruption, the characteristics of the labour market (less office employment), and the quality of transport infrastructure (Bharati & Fakir, 2020).

Countries where the measures have been successful in limiting the spread of the virus are Korea, Singapore and Taiwan (Our World in Data, 2021). Success is attributed to a combination of factors of importance to infections and local factors. In Korea, for example, the low rate of COVID-19 fatalities is attributed to the experience of the MERS virus outbreak, the relatively high trust in authorities, the competencies of authorities, and the availability of technology (high technology, big data), pre-existing legislation, aggressive testing policies supported by a well-developed biotechnology sector, a well-developed health system, and a culture of obedience and civic-mindedness (Sonn, 2020).

Based on our results combined with additional insights from Shortall et al. (2021), Table 2 provides a summary of contextual factors that may favour implementation of certain COVID-19 transport-related measures. The table shows a selection of common COVID-19 transport-related measures as illustrative examples. We stress that this is based on interim evidence and is as such, incomplete, and may be subject to change or additions, depending on future developments in the literature.

Table 2. Potentially favourable contextual factors for common COVID-19 transport-related measures

	Socio-economic factors	Cultural factors	Political factors	Individual factors
Travel restrictions	High income Democracy Older and highly educated population	High sense of citizenship Low frequency of personal contact	High trust in institutions	Pro-social attitudes High risk perception
Telework	High income Developed ICT sector Highly educated workforce			
Promoting micro-mobility or active transport	Existence of or possibility to expand capacity Low car dominance			High risk perception
Public transport improvements (e.g. social distancing, facemasks)	High income Adequate resources	High sense of citizenship High risk preparedness	High trust in institutions	Pro-social attitudes
Capacity management (e.g. increased frequency, staggering)	High income Adequate technology Existence of additional fleet			

3.2 Socio-economic factors

Labour force characteristics

Labour force characteristics are particularly important because they influence the extent to which people can work from home. Office-like employment often lends itself well to this, but various other professions do not. Examples are people working in industry, care, personal services such as hairdressers, and people working in the transport sector. A rough division into economic sectors does not work well for determining the share of office-type employment. For example, there are many people who work in the manufacturing industry, but who have office-type professions. Think of design, marketing and communication, and accounting and finance.

The general picture is that teleworking is generally more possible in countries with higher incomes (Gottlieb et al., 2020) - countries with higher incomes generally have a higher proportion of office-like employment. Moreover, the ICT sector is generally better developed there, making it easier to telecommute technically and in terms of skills.

But not only the proportion of the working population is important for the extent to which teleworking is possible. Other factors also play a role. Rahman (2020) indicates that the degree to which face-to-face contact is important plays a role in the opportunities to telecommute, and that this degree is often related to a higher percentage of women and to lower wages.

People working in the informal sector are more likely to be affected by unemployment due to the COVID-19 virus (Alfaro et al., 2020), and are therefore more dependent on government support (Busso et al., 2020). A high proportion of people working in the informal sector is common in many developing countries. In the US, there are populations that depend on public transport to travel to work because they do not have a car available. For them, safe (low risk of infection) and accessible public transport is of great importance (Brough et al., 2020); without it, they cannot travel to work.

Furthermore, it appears that people with a higher education can telecommute more often than average. In the Global South, relatively many people work in the manufacturing industry, which

requires travel to work (Medimorec et al., 2020). It is estimated that only 13% of workers in a selection of 10 low- and middle-income countries could work from home, compared to 34% in the US. In those countries, people with higher paid jobs and education levels, such as managers, professionals and those working in the field of mental health, have more opportunities to work from home (Bartik et al., 2020; Saltiel, 2020).

Opportunities for teleworking show a spatial pattern: in developed countries such as the US, regions around metropolitan centres such as Washington D.C., New York and San Francisco have, on average, more opportunities for teleworking (Rahman, 2020). Presumably, the nature of employment plays an important role here. Regions with higher job automation tends to displace workers towards low-skilled service jobs, which have lower work-from-home opportunities (Rahman, 2020).

Poverty, social security and financial support

Poverty and related financial support affect how people cope with travel restrictions. For example, in the EU, 29.6 million people do not have the financial buffer for one month's daily expenses, which can be a reason to travel to work (Midões, 2020). Bharati & Fakir (2020) conclude that richer and more democratic countries with, on average, an older and more educated population benefit the most from travel restrictions. In such countries, more people can work from home. Travel restrictions in lower income countries are less effective and should therefore be accompanied by financial and possibly health support. Even within richer countries, this distinction sometimes proves important: in the UK, it has also been found to be true for some deprived neighbourhoods (Atchison et al., 2020).

3.3 Cultural factors

Sense of citizenship

Cultural factors such as the degree to which a society is more collective or individualistic affect the extent to which people comply with travel restrictions and other measures (Frey et al., 2020). In China, stringent measures have been introduced and enforced with draconian measures. However, draconian measures are not necessary in all countries: in some countries, people impose restrictions on themselves out of a sense of citizenship; they consider these restrictions a social obligation (Parady et al., 2020). Japan is an example: it had only non-binding advice to restrict activities. Many meetings were postponed, and visits to all kinds of destinations decreased significantly. In Jakarta (Indonesia), congestion was found to virtually disappear without an official lockdown (Dunford; et al., 2020). In Sweden, only guidelines were introduced, but despite this, people's trips decreased by 70% (Dunford; et al., 2020), and public transport use decreased by percentages up to 60% in most more densely populated regions (Jenelius, 2020). Frey et al. (2020) conclude that more autocratic regimes introduced stricter lockdown and contact related measures, but there is no evidence that these were more effective in restricting travel than less stringent measures. A study from the US shows that restrictions in travel behaviour were more the result of individual choices than government instructions (Goolsbee & Syverson, 2020). A July survey showed that 35% don't plan on going to shopping centres or malls this year (compared to 27% in June). 66% said they would not visit an amusement park (up from 59% in June), and 64% won't attend a live sporting event this year (55% June). Even with offices reopening, 84% indicated that they would still like to work remotely at least occasionally.

In some countries, the government uses tougher measures. For example: in South American countries, strict measures have been introduced, such as patrolling by the military and imprisonment for up to ten years, because the government found the level of compliance unacceptably low. As a result, trust in government and democracy would decrease (Blofield et al., 2020).

Risk perception and cultural factors

Risk perceptions towards the COVID-19 virus vary between countries and groups of people (Atchison et al., 2020), as these perceptions depend on various cognitive, emotional, social and cultural differences between countries and individuals (Dryhurst et al., 2020). Previous experiences with epidemics can also influence the measures countries adopt. Some East Asian countries affected by the SARS or MERS virus in the past appear to be better prepared for the COVID-19 pandemic, as a result of lower mortality rates, rapid implementation of protocols on how to deal with the virus, and a higher degree of trust in the authorities and cooperation with the measures taken by citizens (Lin & Meissner, 2020). Countries such as South Korea, China, Japan and Vietnam were already accustomed to wearing face masks due to air pollution or (fear of) other viruses, and were at the forefront of wearing face masks during the COVID-19 pandemic (Platteau & Verardi, 2020).

Frequency of personal contact and social distancing

The initial outbreak of COVID-19 virus coincided with the annual New Year holiday in China, a period when millions of Chinese travel to visit family (Liu et al., 2020). The extent of interpersonal contact within and between age groups depends on cultural factors. In countries with relatively high levels of interpersonal contact, such as Italy and Spain, more stringent measures appear to have been needed to reduce the spread of the virus (Platteau & Verardi, 2020), and the negative impact of contact restrictions on well-being have been greater. There are also differences between cultures in the extent to which people keep their distance from each other, and the way they greet each other, such as by shaking hands or kissing (Bruns et al., 2020).

3.4 Political factors

Trust in government and institutions

A lack of trust in government and institutions is mentioned in the literature as a factor contributing to lower compliance with restrictive measures. In both less developed (Bharati & Fakir, 2020) and developed countries (Wright et al., 2020), the level of compliance is relatively low among people with lower incomes and regions with lower average income, partly due to a lower level of trust in institutions. Financial support can make people comply better. Within the EU, it was also found that the perception of various measures differed significantly between countries and regions, depending among others on the level of trust in institutions (Sabat et al., 2020).

The level of acceptance of enforcement of rules is likely to be lower in countries where trust in government is low. In China, an app has been introduced that gives people insight into their health. The app uses personal medical information and characteristics of individual travel history to determine whether people are allowed to travel (Zhou et al., 2020). However, this type of technology raises concerns regarding privacy, and due to a lack of transparency regarding what data is stored (Davidson, 2020). Such systems using biometrics and digital identification are unacceptable in more liberal countries (Sonn, 2020), despite their success, and despite calls for their introduction such as from the World Travel & Tourism Council (WTTC, 2020). European research showed that the use of mobile data for contact research was a polarising policy option (Mouter et al., 2021; Williams et al., 2020; Altmann et al., 2020), with the Netherlands, Denmark and Germany showing the most opposition. Resistance was greater among young people (< 25 years) (Sabat, 2020). Moreover, not all countries have had success with such apps (examples: Singapore, Israel), due to inaccuracies and critics who argued that the required funds could have been better used for more aggressive forms of testing (Xiao, 2020).

The debate on whether or not to introduce such apps illustrates the problems governments face with respect to individual freedoms: the freedom to provide information and the freedom of movement (Sonn, 2020). A recent study on political support for various measures in the EU showed that support is particularly strong for banning public meetings and cross-border travel (83% in favour). Support was low for the suspension of public transport services (37% against). Only Italy completely abolished public transport, other countries only restricted its provision. Older people

had the most resistance to restrictions in the provision of public transport. People in Southern European countries overall had a higher degree of acceptance of all measures (Sabat et al., 2020).

Political preferences

Political preferences, which are correlated with trust in government, may influence the extent to which people comply with COVID-19-related transport measures. In the US, compliance with restrictions was found to be higher in regions (counties) with a higher proportion of people older than 65, a lower proportion of the population that voted Republican in 2016, and higher population density. People in Republican regions were found to comply less with calls to stay home. Democrats were found to heed calls from Republican leaders less than those from Democratic ones (Painter & Qiu, 2020). In Brazil, people in cities with strong support for President Bolsonaro were less likely to comply with travel restrictions than people in other cities (Furceri et al., 2020; Mariani & Rettl, 2020).

3.5 Individual characteristics and perceptions

Personality influences attitudes towards COVID-19 measures (Aschwanden et al., 2020), and subsequently behavioural compliance. Howard (2021) concludes that people who are more inclined to take risks as well as those with less pro-social attitudes are more likely to choose economic interests. The perception of personal risk of being infected with the virus was also associated with compliance with measures, which demonstrates the importance of risk communication from governments (Ahmad et al., 2020). Furthermore, data shows that if people perceive measures as effective, they are more likely to act upon them (Vally, 2020). Graham et al. (2020) conclude that individual attitudes and values are more important than external factors for changes in travel behaviour. In the US, UK and South Korea, perceptions of risk were found to have more influence on activity reduction than instructions from governments (Goolsbee & Syverson, 2020; Aum, Lee, & Shin, 2020).

Such individual factors do not only influence behaviour during the corona crisis. It is conceivable that people maintain their behavioural adaptations for some time after the pandemic, for various reasons (Agency, 2020). For example: 53% of users of ridesharing and public transport said they would travel less or no longer by these means, with 30% saying they would only travel by car. 35% said they would no longer visit shopping malls in 2020, and 84% said they would continue to telecommute, at least partially (IBM, 2020).

4. Synthesis, conclusion and future research

In this review, we aimed to better understand the underlying contextual factors influencing COVID-19 transport measures and their effects. An important finding of our first review (Shortall et al., 2021) was that factors underlying the introduction of transport-focused measures cannot be separated from the broader discussion on COVID-19 measures; travel is not a stand-alone activity, but is linked to activity patterns, and many COVID-19 measures target activities or are generic (such as social distancing measures). It is also virtually impossible to determine the independent influence of any transport measures on the effects (i.e. virus spread, economy, well-being).

A second finding of our first review (Shortall et al., 2021) was that there is a large degree of heterogeneity in COVID-19 measures and effects when we compare countries and regions and, therefore, there are almost by definition factors that must underlie such heterogeneity. The determinants we have encountered can be classified into several clusters of factors, the most important of which are: (1) socio-economic factors, (2) cultural factors, (3) political factors and (4) individual factors.

In the category of socio-economic factors, the extent to which people can work at home turns out to be very important for the introduction and effectiveness of COVID-19 measures. This degree depends on the proportion of people with jobs that allow them to work from home, but also on the

quality of information and communication technology available to homeworkers. In the category of 'cultural factors', the extent to which people have a 'sense of civic responsibility' and trust in the government and institutions plays a major role in their compliance with advice and coercive measures. Furthermore, experiences with previous viruses appear to have made a positive contribution to successful COVID-19 policy. From that perspective, positive learning effects from the current pandemic can be expected in new waves of COVID-19 or future pandemics. In addition, the literature indicates that political factors play a role in compliance with COVID-19 measures. The literature mainly gives examples from non-European countries. Finally, individual factors play a role in the compliance with COVID-19 measures. For example, a pro-social attitude is associated with better compliance. And: if people rate the effectiveness of such measures higher, they will act accordingly more often.

As far as the policy relevance of our findings is concerned, we repeat what we said above: the paper provides an interim view (end of 2020); it is quite conceivable that new experiences and studies will lead to an updated view. Nevertheless, some conclusions can already be drawn. First: for policy, the results mean above all that a 'one size fits all' policy is not obvious; policy will have to be context-specific, taking into account the various factors mentioned in this paper. Secondly, if a policy succeeds in increasing people's appreciation of its effectiveness, it is to be expected that more people will comply with it. Good information from independent parties can probably contribute to this. Thirdly, trust in the government and institutions is important for compliance. If the government acts in such a way that people trust the government, a positive effect on COVID-19 policy may therefore be expected. Fourth, the extent to which people work at home is of great importance to COVID-19 policy and its effects. In the first place, governments can set a good example by encouraging or even obliging people to work at home as much as possible. In addition, agreements with employers about working from home can be effective, for example in Germany, extra days off are provided to parents with small children (Duitsland Instituut, 2021). Tax policy may also be an option: people who now travel to and from work by public transport receive tax breaks. These could perhaps be extended to people who work from home to a certain extent.

Future research is very important. First of all, new experience with existing and new measures is highly desirable; at the time of writing this article, we were still in the middle of the COVID-19 pandemic worldwide. Secondly, it appears that the degree of compliance of citizens with voluntary or compulsory measures is of great importance, and that this degree of compliance is strongly related to various factors. Further research into citizens' behaviour and its determinants is therefore very important. Thirdly, when the crisis is over, it is not necessarily the case that people will revert to their old behaviour (pre COVID-19). Longer-term effects are quite conceivable, for example through attitude changes or more experiences with tele-activities. We can see the COVID-19 pandemic as a kind of real life experiment that provides a lot of useful material for further research into long term behavioural changes.

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