In Government and Scientists We Trust:
Compliance during the COVID-19 pandemic in the Federal Republic of Germany

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Abstract

As SARS-CoV-2 entered Germany, the government introduced containment measures designed to suppress transmission. This article tests if compliance with those measures was influenced by trust in the governing, health and scientific institutions that were managing the crisis. To test this, the research draws on a unique panel survey collected amidst the early days of the pandemic by the GESIS Leibniz-Institute for the Social Sciences. Using principal components analysis, the study firstly shows that the trust questions may be reduced to three dimensions: trust in scientific, political and regional institutions. Multivariate generalised linear models then test five hypotheses at the individual-level. Rather than all forms of trust exerting an impact, trust in scientific and political institutions influenced adherence to the restrictions, particularly by reducing social contacts, avoiding crowded places and maintaining social distance. These effects endure net of political partisanship and exposure to social media. By demonstrating that trust influenced compliance, we reframe a public health emergency as one set within a relationship between citizens and the state and advocate for policy learning structures in which the role of trust is more meaningfully incorporated.

Keywords: trust; government; compliance; Covid-19; health policy.

Words: 9831

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Es ist Ernst. Nehmen sie es auch Ernst.[1]
– Angela Merkel, 20th March, 2020.

Introduction

In March 2020, an infectious and potentially fatal coronavirus (SARS-CoV-2)[2] led the German government to restrict liberty to levels that were without precedent in the post-war Federal Republic. In a sobering address on 20th March, Angela Merkel set out the scale of the challenge and its consequences for civilian life in Germany. In the following days, the government restricted social interactions and access to public and private spaces. These were presented as protective measures designed to alleviate the risk to public health. All areas of society were urged to follow the restrictions in language that emphasised trust in the government's management of the crisis. This, however, underlined an important paradox that has long been central to the study of political attitudes: trust in government underpins compliance with sacrificial policies (Hetherington 2005: 3-5); and yet falling trust in government has been one of the most frequently-cited trends in the literature on political attitudes (Foster and Frieden 2017; Jennings *et al*. 2017; Van Erkel and Van Der Meer 2016; Dalton 2004: 29). To what extent, then, did trust influence people's preparedness to adhere to restrictions? And in which institutions did it matter the most? These are the two questions that this study seeks to address.

In answering them, the research contributes to clarifying the empirical relevance of trust during the early – and most acute – part of the pandemic. Trust has been subjected to wide-ranging investigation, but its impact is contested (Bol *et al.* 2020: 498). Much of the existing research centres on the period after restrictions were imposed but is unclear about

[1] 'It is serious. Take it seriously.' (author's translation)
[2] At the time of writing, these are relatively uncontroversial points. There have, however, been disputes on how infectious and lethal (SARS-CoV-2) is. Estimates of the original strain suggest a basic reproduction number of 3 and a fatality rate of 1.1 percent of those infected. As a rough guide, then, compared with seasonal flu SARS-CoV-2 is 3 times more infectious and ten times more lethal (Spiegelhalter and Masters 2021: 144-8).

whether it inhibited or facilitated effective governance. According to one study, trust contributed to creating support for elite policy decisions, which aided vertical and horizontal policy coordination (Weinberg 2020: 17-18). Trust aided risk perception (Dryhurst *et al.* 2020: 998), public communication and the effectiveness of targeted messaging (Balog-Way and McComas 2020), whilst also leading people away from disconfirmatory speculation to more reliable and falsifiable sources (Karić and Međedović 2021). Trust facilitated the use of digital contact tracing applications (Goldfinch *et al.* 2020: 8-9), whilst also contributing to a wider public acceptance of policies designed to suppress transmission, especially mask wearing and social distancing (Jäckle *et al*. 2022: 13-16; Kazemian *et al.* 2021: 14). A significant body of academic research, then, suggests that higher trust societies may be able to mitigate the effects of the virus compared with those in which it is lacking (Zaki *et al*. 2022: 16-17).

Yet the evidence is not clear cut. The literature is replete with methodological problems that are sufficiently serious to challenge any sense of a stable and robust relationship. There is conceptual imprecision (Dryhurst *et al*. 2020: 997), conclusions drawn from analyses that do not explicitly measure trust (Wong and Jensen 2020: 1026) and the use of different indicators of trust targeting contrasting parts of the political system (Schraff 2021: 1009). Variation in findings, then, may be attributable, in part, to methodological diversity in the questions asked. Some studies, for example, show that trust in scientific, rather than political, institutions drives acceptance of restrictions, whilst interpersonal trust reduces threat perception (Jäckle *et al*. 2022; Thoresen *et al*. 2021). Analysing the UK, Australia, USA and Italy, Jennings *et al*., (2021: 15, emphasis added) found that 'trust is only related to behavioural adjustment in the UK, and negatively so: trusters are *less* likely to adjust their behaviour, which is in line with some research which has shown trust may lead to lower risk perception and greater complacency.' Similar findings have been uncovered in Japan and Hong Kong (Goldfinch and Taplin 2022: 10). Analyses of social media in Singapore, meanwhile, also confirmed that trust reduced risk perception, resulting

in lower and more selective compliance (Wong and Jenson 2020: 1027-8). And this, in turn, has led some scholars to argue that whilst trust increased in some countries as the pandemic arrived (Bol *et al*. 2020; Esaiasson *et al*. 2020), this did not engender positive implications for democracy. According to Schraff (2021: 1015), it represented a 'collective angst' from the intensity of the situation and created circumstances in which the normal yardsticks for evaluating government were discarded. An equally significant body of academic research, then, challenges claims that trust leads to compliance and has uncovered evidence that it may actually reduce risk perception.

This study adjudicates between these two bodies of literature. It pinpoints the forms of trust that matter and the measures of compliance on which their effects are most pronounced. The central finding is that trust in political and scientific institutions influenced voluntary compliance with restrictions. This matters because governments may request (or demand) compliance but it need not be forthcoming. Legalised restrictions take time to create and in the intervening period governments must appeal to people to follow their advice. If trust contributes to this, it would constitute an empirical demonstration of its importance to the management of public health emergencies (Bianco 1994: 74-5). As this study uses data that were predominantly gathered prior to the Federal legislation on restrictions coming into effect, it enables us not only to generate insights into this but to examine if trust shapes voluntary compliance rather than abiding by the law. The research thus makes an important conceptual distinction between trust on the basis of government recommendations (Sztompka 1999: 51-2) and trust once constitutionally-recognised processes have been followed. Since governments may find themselves in situations where their only recourse is to appeal for compliance, the implications of this distinction extend beyond the pandemic. Above all, if trust provides policy-makers with time, governments need not make knee-jerk reactions and rush legislation through the policy process. Trust may enable them to address complex policy problems more effectively and avoid implementation gaps.

The study is divided into five sections. First, we define trust and set out its theoretical connections to behaviours. Definitions have varied widely and the differences are not merely sematic (Schraff 2020: 1009; Wong and Jensen 2020: 1026; Jäckle *et al*. 2022: 9). As the government drew upon scientific and technical institutions to legitimise its decisions, the substantive meaning of the concept differed and we depart from orthodox definitions in recognition of this. After reframing the concept, it is contextualised within the decision-making structure in Germany during the pandemic and incorporated into a theoretical framework connected to compliance. Second, hypotheses are drawn to test theoretical claims and guide the analysis. Third, we introduce the data on which our empirical testing is based. Fourth, descriptive analyses of trust and compliance are presented before turning to principal components analysis, generalised linear models and post-estimation analyses. Finally, the implications of this study are discussed for epistemic policy learning and crisis management.

Trust in institutions: concepts and behavioural linkages

The starting point is to define trust, contextualise it within the pandemic and anchor it to a theoretical framework connected to behaviours. At its simplest, trust is an attitude that is built up through an accumulating set of experiences and denotes integrity and reliability. Trust is a relational concept with affective, cognitive and evaluative components (Almond and Verba 1963: 227). Its affective components signify deep and durable connections, akin to attachment, whilst its cognitive and evaluative properties stem from knowledge, information or performance, meaning that it may be revised and adjusted in a seamless process of experiential learning (Mishler and Rose 1997: 456). Trust, then, is part of a syndrome of supportive political attitudes that bind people to representative institutions and create a basis for a well-functioning relationship between citizens and the state (Dalton and Welzel 2014: 8). But what if people have insufficient knowledge to judge institutions? The pandemic raised the profile of institutions and agents not commonly included within batteries

of questions on trust in government – particularly those with a health and scientific remit. And if the public have no experience to guide their answers, it is reasonable to assume that they will have some measure of instability. As Offe (1999: 70-71) argued, however, one resolution to this is that people may use reputation or the norms of office as short-cuts to their answers. Since democratic institutions have constitutive rules and procedures, people may trust them to the extent that they may be expected to adhere to established conventions and follow institutional rules.

Yet most studies define trust by referring to its functions. Principal amongst these is its role in decision-making. According to Klingemann and Fuchs (1995: 22), trust represents 'the subjective probability of a citizen believing that the political system, or parts of it, will produce preferred outcomes even if this citizen takes no part in its production'. Trust, then, serves as a 'creator of collective power' (Gamson 1968: 42-43). By providing 'governance capital', it enables authorities to act in uncertain or risky situations (Rose 2004: 4), for as trusted institutions are granted a measure of leeway, they may make commitments on the basis of it without obtaining explicit approval or resorting to coercion (Bianco 1994: 23). This enables institutions to perform better in adverse circumstances, which creates further trust and generates a virtuous cycle of trust and good governance. A series of mis-steps, meanwhile, if uncorrected, may tarnish institutions irreparably, leading to a vicious circle of falling trust and institutional gridlock. The corollary of this is as Gambetta (1988: 234) has argued: 'once distrust has set in it soon becomes impossible to know if it was ever in fact justified, for it has the capacity to be self-fulfilling, to generate a reality consistent with itself.'

Trust, then, connects individuals to institutions and enhances their capacity for effective performance. It has thus been described as a 'pre-requisite for democracy' (Sztompka 1999: 144) and a substantial body of literature has provided a running commentary on it, with most authors focussing on the major representative and judicial institutions of the state (Miller 1974: 953; Norris 1999; Zmerli and Newton 2001). An important analytical point, however, is that the institutions used in these studies differ in

nature and function: some establish the legislative agenda, whilst others perform scrutiny and accountability functions. One consequence of this is that trust ebbs and flows on the basis of the fluctuating performance of governments, but displays greater durability when directed towards institutions that are foundational to the system (Dalton 2004: 35). These empirical distinctions are reminiscent of Easton's (1975: 437) theoretical work on 'specific' and 'diffuse' support and his claim that 'not all expressions of unfavourable orientations have the same degree of gravity for a political system. Some may be consistent with its maintenance; others may lead to fundamental change'.

These points are crucial to conceptualising trust in this study. In the first place, the pandemic altered the meaning of trust in government in Germany. The role of the Chancellor and Health Minster were elevated in ways that could scarcely have been envisaged by the framers of the German Constitution, the Basic Law. Whilst there has always been a degree of 'permissive support' given to German Chancellors, most have carefully avoided encroaching too far on the principles of federalism, subsidiarity and the core powers of the state (Paterson and Southern 1994: 142-3). Yet emergency legislation (the Population Protection Act), approved by the Bundestag on the 27th March, 2020, attracted controversy due to its undefined legal term and the fact that health is an area of 'concurrent' policy-making, meaning that responsibility for it is shared between the Federal government and the sixteen *Länder* (Hyde 2021: 1610). This matters because if the Chancellor and Federal government were perceived to be acting beyond their remit, the more likely it would be that they would encounter resistance from the *Länder*; and the more resistance that followed, the greater the potential for asymmetrical approaches that would undermine the management of the pandemic.

Shrewd political leadership was needed. Arguably, however, the manner in which decision-making was made complicated the trust calculus. Decisions were perceived to have been taken within the Minister Konferenz, a meeting of the Chancellor and the sixteen Minister-Presidents of the German *Länder*. This did not always secure immediate or

unconditional agreement. In some instances, indeed, it emboldened critics, who cited the limited opportunities for parliamentary oversight and the lack of clarity on how the proposals could be reformed. It fuelled claims of 'legitimacy deficits' by members of the Bundestag, including from within the Grand Coalition government.[3] On this, we make no normative argument about the degree to which this was necessary and/or proportionate. We simply point out that people were being asked to trust institutions that were operating in a manner that was qualitatively different from their constitutionally-defined remit. This resulted in a somewhat paradoxical situation: as the government grappled with the pandemic, it appealed to people to trust it; and yet the expansion of executive power and limits on parliamentary and regional oversight could have justified caution or scepticism.

In addition, institutions gained prominence that were less familiar to the public, some of which may have been trusted on the basis of their reputation. A case in point was the World Health Organisation (WHO). Although people may have been aware of the WHO, the full scope of its remit became apparent when it declared a global public health emergency on 30th January, 2020, and became the focal point for estimates of the transmissibility and virulence of Covid-19. Its role as a coordinating hub informed the Robert Koch Institute's (RKI) research into disease prevention, which was crucial to government planning and decision-making. The government repeatedly drew on its advice, along with that of leading virologists.[4] As a scientific institution, it was more distant and less politicised compared with the main institutions of government. It emphasised that its role was to advise the government and improve public understanding of the risks. In doing so, however, it was clear from the language used by ministers and scientists that it underpinned government policy with a form of 'scientific-technical legitimacy'.

[3] Among the most vehement critics was Florian Post, a member of the Bundestag and legal affairs expert with the Social Democrats (SPD), the junior partners in Angela Merkel's coalition government, who repeatedly complained about the democratic deficit in the decision making, including within an application to the Federal Constitutional Court.

[4] One key figure was Professor Dr. Christian Drosten, who featured in numerous public broadcasts to explain aspects of the pandemic.

Trust and behaviours

Why would trust in these institutions lead to compliance with public health restrictions? Academic research contends that the more trusting people are, the more likely they will alter their behaviour in ways that align with that trust (Scholz and Lubell 1998). This stems from theoretical literature that holds that there should be a degree of consistency between attitudes and behaviours (Ajzen 1989: 244-8), the core claim of which is that people are assumed to behave in ways that are evaluatively consistent with their attitudes. This is referred to as the principle of 'compatibility', which recognises that there can be global attitudes with general referents, but those with more specific targets exert greater influence on behaviours (Ajzen and Fishbein and 1977: 889). Even so, attitudes are merely one part of a broader syndrome of beliefs and empirical connections from attitudes to behaviours often appear weak. This may be due to the complexity of the behaviours involved (Dalton 2004: 174), or due to the fact that over time behaviours may become habitual in ways that diminish the conscious attention to the attitudes underpinning them. But these caveats notwithstanding, there are well-established connections between political attitudes and behaviours, which hold that attitudes are utilitarian heuristics that guide behaviours, intentions and commitments (Marien and Hooghe 2011: 268-72).

This is why trust has been connected to support for sacrificial policies. Studies have shown that people who trust government will support policies from which they derive little benefit (Hetherington 2004: 4). The more sacrificial the policy, the more trust will be required for its acceptance; absent trust, policies will be viewed as unnecessary and/or punitive and generate lower levels of compliance (Rose 2004: 4). To illustrate, studies have examined support for the expansion of the welfare state (Gabriel and Trüdinger 2011), the redistributive aspect of which requires people to sacrifice greater proportions of their income in tax receipts to fund policies from which they may not personally benefit (Hetherington 1998: 792). In this situation, people must trust the aims and implementation of the policy –

and if they do so, they will be more inclined to support the programmes. Trust and policy acceptance are thus closely-related and mutually-reinforcing (Levi 1997: 21).

Similar reasoning has been applied to public health emergencies, including epidemics (Blair *et al.* 2017). This has shown that people will comply with measures to supress transmission if they trust those managing the situation (Baum *et al.* 2009). Whilst it is tempting to extend this reasoning to the coronavirus pandemic, the connection may not be entirely straight-forward. In particular, the sacrifices required during the SARS-CoV-2 outbreak were different. First, they entailed self-denial beyond anything previously envisioned in the literature on political trust. Some mandated the physical separation of families, even when individuals were vulnerable or close to mortality. Others restricted human rights, including freedom of expression and religion – rights, moreover, that are enshrined in the German Basic Law and the European Convention of Human Rights (ECHR). Second, the measures persisted indefinitely and required long-term buy-in. Enduring restrictions in basic liberties when government is uncertain about when they may be restored requires ongoing trust in those recommending them. Third, people were being asked to abide by restrictions which may have been harmful for them to practice. Restrictions had inimical repercussions, particularly amongst those at enhanced risk of suffering damaging physical or psychological consequences.

Research design

To examine how trust influences compliance, five hypotheses are tested. Our first task is to reduce the trust questions to enable them to be used in multivariate models. Nine separate trust questions were asked and we hypothesise that these may be reduced to three dimensions. The first is institutions that have a political focus: (1) the Chancellor; (2) the Federal Government; and (3) the Federal Health Ministry and we hypothesise that these items will form a dimension labelled ‘trust in political institutions’. Second, there are

institutions that have a scientific focus, derived from the trust questions about: (1) the Robert Koch Institute; (2) Scientists; and (3) World Health Organisation and we hypothesise that these will form a dimension about 'trust in scientific institutions'. Finally, three items located at a more regional level are trust in: (1) the Municipality and City administration; (2) the local Health Authorities; and (3) the respondent's General Practitioner and we hypothesise that these form a dimension labelled 'trust in regional institutions'. Overall, then, we suggest:

> H_1: the items in the GESIS panel Survey constitute three dimensions of trust in political, scientific and regional institutions.

A second hypothesis tests connections between trust and compliance. Following the theoretical framework, trust should increase compliance. As the survey contains data on a wide variety of restrictions, we frame this in general terms:

> H_2: trust in institutions increases compliance with different forms of restrictions.

Having acknowledged the importance of the relationship between citizens and the state, it is possible that confounding variables may create asymmetrical levels of compliance. Research has demonstrated that trust is influenced by a wide variety of social and political factors, all of which remained in operation during the pandemic (van Dijck and Alinejad 2020; Zhao et al. 2020). A case in point is education (Goldfinch *et al.* 2020: 9). Education has been shown to have a decisive influence on trust, although the direction of the effect does not always lead to greater trust (Dalton 2004: 86-7). In this study, we conceive of education as a generalised cognitive resource, which equips people with the skills to comprehend aspects of the health emergency and extract knowledge and information about it. We hypothesise that during the onset of the pandemic, educated individuals may be more likely to understand the challenges faced by government, defer to it and comply with public health guidance:

H_3: education moderates the effects of trust on behavioural compliance with restrictions.

In addition, partisanship has been shown to influence compliance (Goldstein and Wiedemann 2021: 3). To assess its impact, two related hypotheses are tested. First, studies have demonstrated that trust is influenced by whether or not people voted for the governing parties in national elections (Anderson *et al.* 2005). Electoral outcomes generate partisan competition over government, which reorganises individuals' political beliefs and leads to distinctions in trust between voters of the winning and losing parties (Anderson and Guillory 1997; Anderson and LoTempio 2002). Winners, therefore, may have greater trust in government and be more inclined to follow their advice (H4). Second, national populism may have influenced people's willingness to follow restrictions. This is so due to the underlying worldview through which populist voters examine democratic politics. Studies of the demand-side of populism have uncovered that populist voters are more inclined to have low trust in democratic institutions (Norris and Inglehart 2019: 431-4), stemming from suspicion of an elite-driven politics that emphasises the power of a corrupt and exploitative establishment (Mudde and Kaltwasser 2017: 6). The anti-establishment ethos of populist voters may have had important repercussions for abiding by restrictions, for this meant trusting experts, health professionals and behavioural scientists. Populist voters may be more likely to reject their claims and expose themselves to information that minimises the risk of Covid-19, whilst denying the legitimacy of those in government seeking to curtail it (H5).

H_4: voting for the governing parties increases compliance with restrictions.

H_5: voting for populist parties decreases compliance with restrictions.

Data and methods

To test these hypotheses, this study uses the GESIS Panel Survey (ZA5667). This survey was completed online between 17th - 29th March, 2020, and contains data from 3765

respondents aged over 18 permanently resident in the Federal Republic of Germany. Because the survey was administered early in the pandemic, respondents were not selected at random and it is not possible to make inferences from the sample to the population. This is an important limitation: the non-random method of data collection means that the findings must be interpreted cautiously and that the consequences of sampling theory cannot be applied (Moser and Kalton 2001: 63). Despite this caveat, the data enables us to gain insights into the linkages between trust and compliance with a degree of precision. As mentioned, it contains an extensive battery on trust with nine separate questions asked on a range of institutions, enabling us to conduct a more fine-grained analysis distinguishing between the effects of trust in scientific, political and regional institutions.

In addition, the survey contains data on a wide range of compliance measures, which form the dependent variables in the analysis. Questions were asked on: (1) reducing social contact with people; (2) avoiding places; (3) wearing face coverings; (4) quarantining when symptomatic; (5) quarantining when not symptomatic; and (6) and increased hand washing. These are dichotomous variables coded 1 if respondents had undertaken them and 0 if they had not. Since there are meaningful differences between them, they will be modelled separately rather than constructing an additive scale, enabling us to leverage greater insights.

Hypothesis one examines the connections between the trust questions. Principal components analysis is used to establish how well the trust questions scale together and if they may be reduced to the three categories posited. Generalised Linear Modeling (GLM) then test hypotheses 2-5. Seven fixed-effects logistic regressions examine the influence of trust on separate indicators of compliance. These are supplemented with models testing for interactive effects between trust, education and compliance. Rather than clutter the narrative with tables presenting the full results, the main findings have been extracted and visualised in a ‘forrest’ plot. This was created using the ‘jtools’ package in R. For readers interested in examining the full results of the multivariate models, they are provided in tables

4 and 5 (appendixes 1 and 2). We are reluctant, however, to rely exclusively on statistical coefficients to interpret the results and studies caution against this approach (Mood 2010: 63). As checks of robustness, the models are supplemented with post-estimation analysis of marginal effects, calculated using the 'effects' package in R (Fox and Weisberg 2015) and visualised using 'ggplot2' (Wickham 2016). In particular, we use conditional effects to calculate the predicted probability of complying with restrictions for each level of trust, whilst the remaining variables are held at the arithmetic mean. This shows how the predicted probability of compliance changes as trust alters net of the remaining variables in the models. All models control for education, age, gender, left-right self-placement and social media usage. Full question wording and recoding procedures are provided in the methodological appendix.

Mapping trust and compliance

Prior to testing the hypotheses, the levels of trust in the various institutions are presented.

--Table 1 here please--

Table 1 presents the mean and standard deviation for each institution. For clarity, trust is measured on a five-point scale ranging from 0-4, where 0 represents no trust and 4 represents complete trust. Two important points stand out from the table. First, trust is more extensive in scientific institutions: the Robert Koch Institute receives the highest level (3.44), followed by scientists (3.24), suggesting that scientific and technical institutions attract stronger funds of trust compared with the more political or regional institutions. Since the standard deviations are also smaller, it suggests that respondents' answers are less dispersed and tend to cluster around the mean.

A second point is that there is variation in trust. A full increment of difference is found between the most trusted (Robert Koch Institute) and least trusted institutions (Municipal and City Administration, 2.44). Examining the more political institutions, meanwhile, the

Federal Health Ministry is the most trusted (2.82), whilst the Federal Government (2.66) and Chancellor (2.57) receive lower levels. Even in acute circumstances, then, the Federal government and the head of the executive branch attract caution amidst evidence of people distinguishing in their evaluations of different institutions. Rather than uncovering evidence of blanket approval or repudiation – or of attitudes polarising between those who trust and those who do not – the pattern varies depending on the institutions evaluated.

--Table 2 here please--

Table 2, meanwhile, shows varying degrees of adherence to public health measures. Since these data were collected early in the pandemic, it is likely that the severity of the virus had not yet fully resonated and some lack of compliance was inevitable. Compliance with regulations on isolation, particularly when symptomatic, appears low (2 percent). Compliance with wearing face coverings is also limited (4 percent). Yet between 80-91 percent were maintaining social distance, avoiding places, reducing contact with people from other households and more frequently washing their hands. Even if there an element of social desirability in the answers, the evidence of widespread behavioural change in line with public health messaging is unmistakable.

Results

As the survey included nine separate questions on trust, any model including all would risk problematic levels of multicollinearity. Principal components analysis, however, enables us to reduce the items and obtain insights into the degree to which they are related.

--Table 3 here please --

The results (table 3) confirm that the items may be reduced to the three hypothesised dimensions. Each obtains a sum of squared loading surpassing 1, the threshold beyond

which they may be retained for empirical analysis. In addition, the cumulative proportion of variance explained by each dimension is 34, 55 and 76 percent respectively, suggesting that we may reduce the nine trust items to the three dimensions and retain around 76 percent of the variability in our original data. These preliminary findings validate our intuition about how these items connect together.

The first dimension is trust in scientific institutions. Three trust items load well on this dimension: the Robert Koch Institute (0.70), the World Health Organisation (0.58) and Scientists (0.92). The second dimension concerns the more political institutions and the strongest loading items are: trust in the Chancellor (0.97), the Federal Government (0.91) and the Federal Health Ministry (0.82). These questions scale well and may be grouped as hypothesised. Finally, there is a dimension targeting more regional institutions, consisting of trust in the local doctor (0.91), the Local Health Authorities (0.66) and the Municipal and City Administration (0.63). Although these three items do not scale as well together, their loadings exceed the required benchmarks and suggest that they may be grouped together.

To summarise, the principal components analysis has supported our expectations that the trust questions may be reduced to three dimensions: (1) trust in political institutions, consisting of the questions on the Chancellor, the Federal Government and the Federal Health Ministry; (2) trust in scientific institutions, consisting of the questions on the Robert Koch Institute, Scientists and the World Health Organisation; and (3) trust in regional institutions, consisting of the questions on the Municipal and City Administration, the Local Health Authorities and the respondent's General Practitioner. These dimensions will be used in the multivariate analyses, the results of which are presented below (figure 1).

Multivariate results

--Figure 1 here please--

Multivariate results suggest that these trust dimensions impact behavioural compliance, although we must caveat this finding carefully. For clarity, the full models are presented in appendix 1, table 4, and the central findings from the trust indicators have been extracted and visualised in figure 1. This depicts the logits of the trust indicators from the four models in which their effects have largely exceeded the significance threshold. There are some exceptions to this, but all coefficients that do not touch the vertical dashed line are statistically significant.

As a general finding, all forms of trust do not positively influence all forms of restrictions. The models have distinguished the forms of trust that matter and the measures of behavioural compliance on which their effects are significant. Trust in scientific institutions increases compliance, with effects on avoiding places, reducing social contacts and more frequent handwashing. Trust in political institutions, meanwhile, also influences these forms of compliance but has an additional effect on social distancing. Examining the coefficients (table 4), they are modest, but not trivial. A one-unit increase trust in scientific institutions increases the logged odds of reducing social contacts by .15 net of the effects of the remaining variables in the model. A one-unit increase in trust in political institutions, meanwhile, increases the logged odds of maintaining social distance by .08.

Yet not all forms of trust increase compliance. As shown in the figure, the logits for trust in regional institutions indicate generally weaker effects, most of which have failed to surpass the significance threshold. But one model is an exception to this. As shown, trust in regional institutions makes individuals less likely to reduce social contacts. The coefficient is negative and significant, indicating that it reduces compliance – a finding that is in line with research that has shown that some forms of trust reduce risk perception. This seems somewhat counter-intuitive, but perhaps the presence and visibility of local actors conveys

the impression that the situation is under control and that individual behavioural change is unnecessary.

--Figures 2 and 3 here please--

Figure 1 and table 4 summarised the statistical models, but this may be extended through post-estimation analyses. In figures 2 and 3, the effects of trust in scientific and political institutions have been graphed on the predicted probability of reducing social contacts. These figures show how the predicted probability of reducing social contacts alters as trust increases. The solid black lines show the predicted probability, whilst the dotted lines show the 95 percent confidence intervals. In figure 2, the solid line rises as we move from the lower end of the trust scale to the higher end, confirming that as trust in scientific institutions increases, the probability of reducing social contacts increases. Figure 3, meanwhile, shows a similar effect for trust in political institutions. As trust increases, the predicted probability of reducing social contacts increases. The evidence from the models and post-estimation analyses is consistent: trust in scientific and political institutions contribute to complying with behavioural measures designed to constrain transmission.

A second point concerns the variables measuring partisanship (table 4). Overall, these operate fairly consistently and suggest that the early phase of the pandemic was not especially politicised. In many respects, this may be of some relief: traditional fault-lines of party competition were largely subdued. As individuals who voted for the governing parties do not appear statistically more or less likely to adhere to restrictions, hypothesis 4 is rejected. And a broadly similar point obtains to voting for the populist *Alternative für Deutschland*, but with one counter-intuitive exception. Voters of the AfD appear to be somewhat more likely than non-voters to wear a mask. However, given that the preponderance of the evidence does not appear to support hypothesis 4, it is also rejected.

Third, some of the effects from the demographic controls are noteworthy. The coefficients for gender, for example, indicate that males are less likely to adhere to some

forms of restrictions compared with females, which is in line with some previous research (Yildirim *et al*., 2021: 39-40). The effect from age, meanwhile, although inconsistent, generally suggests that older individuals are more cautious and are more likely to follow restrictions compared with those who are younger. And those with higher education are more likely to adhere to the restrictions. Together, these findings indicate the presence of different perceptions of risk: men appear less likely to mitigate the risk, whilst educated and older individuals are more likely to do so – a finding which makes sense, if we assume that co-morbidities correlate with age.

Before closing the analysis of the results, they have shown that education increased compliance. The effects are not uniform across all models or levels of education, but those with higher education appear to be more likely to reduce their social contacts, avoid places and more frequently engage in handwashing. To examine if education moderates the effect of trust on compliance, further modelling was conducted (appendix 2, table 5). For clarity, this section was limited to these three dependent variables (avoiding places, handwashing and reducing social contacts) but included multiplicative interaction terms for trust in scientific institutions and education and trust in political institutions and education.[5]

--Figure 4 here please—

Examining the coefficients in table 5, there is little to suggest that education and trust interact to increase compliance. The table contains two columns for each dependent variable. The main effects were modelled (models 1, 3 and 4) first before interaction terms were added (models 1a, 3a and 4a). Only one interaction term has surpassed the significance threshold: trust in scientific institutions on the mid-level of education on avoiding places. But the balance of evidence challenges suggestions that education moderates the

[5] Readers will note that in the model for reducing social contacts, trust in regional institutions emerged as negative and significant. As a follow-up to the analysis in table 5, we tested for an interaction effect between trust in regional institutions and education but none was detected.

effects of trust on compliance. Trust increases compliance but not significantly amongst those who are trusting and educated.

To explore the interaction terms in more depth, post-estimation analyses have been conducted. Conditional effects have been calculated and graphed (figure 4). Figure 4 displays the predicted probability of reducing social contacts by trust in scientific institutions with separate lines showing the effects for different levels of education. To improve the clarity of the visualisation, the confidence intervals have been removed. This is an important. Because the confidence intervals overlap heavily between the different levels of education, it explains why the interaction coefficients failed to exceed the significance threshold and cautions us against accepting hypothesis 3. Yet the lines are nevertheless substantively interesting and their trajectory suggests this might be something to which future research could return. The lines for those with the highest levels of education follow a similar upward trajectory, meaning that the probability of reducing social contacts increases as we move along the trust scale and up the education scale. Evidence that reducing social contacts is more likely amongst those trusting of scientific institutions and more educated is not negligible, although given the heavy overlap in confidence intervals there is insufficient evidence to confirm the presence of an interaction effect. As the balance of evidence across the three models has failed to demonstrate that compliance is more amplified amongst those who are trusting and higher educated, hypotheses three is rejected.

Summarising the findings, they have shown that the trust items may be reduced to three dimensions. This enabled us to examine the role of trust on a variety of forms of compliance through multivariate modelling. Rather than a uniform influence, however, the effects of trust are subtle and targeted. Trust in scientific institutions influences individuals' preparedness to avoid places, reduce social contacts and more frequently engage in handwashing. Trust in political institutions, meanwhile, influences avoiding places, maintaining social distance, reducing social contacts and more frequent handwashing. The following paragraphs develop the implications of this.

Conclusion

This study has shown how the pandemic was set within a relationship between citizens and the state. As it was initially framed as a public health emergency, policy-making focussed on the timing and activities of government. Responding with agility and flexibly targeting containment measures was viewed as the most effective way to reduce infection, hospitalisation and fatalities. The reasoning here was straight-forward and we do not dispute it. Early mitigation saved lives. But whilst this emphasised the health emergency, the pandemic should be properly viewed as a *public* health emergency – an emergency in which the public were not just passive recipients of state intervention but active participants in a collective effort. And how prepared they were to participate in that effort was influenced by their trust in the institutions recommending behavioural change. This has been accepted politically but rarely has it went beyond a cursory rhetorical acknowledgement and translated into meaningful action where the social aspects of the pandemic have been given the prominence they deserve.

A case in point is the development of new advisory structures. In Germany, a panel of experts (Der *ExpertInnenrat der Bundesregierung*) has been tasked with advising the government on the country's preparedness for future stages of the pandemic. Its membership stretches across the scientific community, but omits social scientists. As has been shown by the research in this article, meaningful epistemic policy learning requires us to go beyond the health and medical aspects and explicitly consider the impact of trust.

Accepting that trust matters, meanwhile, is insufficient. This article pinpointed the forms of trust that matter and the behavioural indicators on which their effects are most pronounced. It did not uncover a straight-forward picture in which every form of trust positively influenced every form of compliance; trust is a complicated concept and elite discourse must take account of the forms in which it is manifested and the asymmetrical ways in which it influences compliance. As shown, trust in scientific and political institutions led people to reduce social interactions, avoid crowded places and maintain social distance.

This had practical implications. First, it contributed to stemming transmission, enabling the government to bolster the healthcare infrastructure and avert its overload. In effect, trust bought time. Second, it reduced the need for intervention from law enforcement, meaning the management of the pandemic could be handled in a more consensual way. Heavy policing or arbitrary enforcement could have undermined social cohesion in ways that were counter-productive to stemming transmission. In effect, then, trust brought acceptance. And third, it mattered for public deference to decision-makers. As people deferred to those with credible information about the nature and risks of the virus, trust provided scientists with an opportunity to balance the information environment and challenge low-information reasoning.

True, there are limitations to this study. The data were not collected through random sampling and we cannot make inferences to the population. This is a consequence of data collection processes in circumstances in which the only methods available were non-random. Despite this, the research has uncovered that there were linkages between trust and compliance during the early phase of pandemic – and, in our view, this remains of immense theoretical importance. An additional caveat is that the results do not permit comment on the direction of 'causality'. This is often a preoccupation of readers and presumes that one may always be easily detected. It could run from trust to compliance, but it cannot be ruled out that it operates in the other direction, with compliance influencing trust. Quite possibly, however, both may reinforce one another in mutually supportive ways. To disentangle these issues would require different data and alternative methods and this may be task to which future research returns.

In the meantime, this study has uncovered important insights into compliance with government restrictions. This was one of the most important issues at the centre of government decision-making during the Covid-19 pandemic and the degree to which people would be prepared to accept far-reaching limitations on liberty could not be taken for granted. Research has shown that trust influenced compliance when governments create

laws, but this analysis has shown its impact on voluntary compliance before laws were enacted. In making this finding, trust has yet again emerged as a crucial influence on politically-relevant behaviours. This underlines the importance of building it, the necessity of maintaining it and the potential consequences of losing it.

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Table 1: Trust in Institutions

	Mean	Standard Deviation
Robert Koch Institute	3.44	0.77
Scientists	3.24	0.79
Local Doctor	3.15	0.92
World Health Organisation	2.97	0.95
Federal Health Ministry	2.82	1.0
Local Health Authorities	2.81	0.89
Federal Government	2.66	1.01
Chancellor	2.57	1.15
Municipal and City Administration	2.44	0.96

Notes: entries are means and standard deviations.
Figures have been rounded to two decimal places.
German residents only.
Source: GESIS Panel Survey, 2020

Table 2: Self-reported Compliance (%)

Behavioural Measure	(%)
Wash hands more frequently	91
Reducing Contact with People	85
Avoid Places	84
Maintaining social distance	80
Isolating when not symptomatic	9
Wear face covering	4
Isolating when symptomatic	2

Notes: entries are percentages
German residents only.
Source: GESIS Panel Survey

Table 3: Principal Components Analysis of Trust, Gesis Panel Survey

	Scientific Institutions	Political Institutions	Regional Institutions
Robert Koch Institute	**0.70**	0.08	0.14
Scientists	**0.92**	-0.09	-0.01
World Health Organisation	**0.58**	0.38	-0.08
Federal Health Ministry	0.12	**0.82**	0.03
Federal Government	0.04	**0.91**	0.03
Chancellor	-0.06	**0.97**	-0.01
Local Doctor	-0.01	-0.15	**0.91**
Local Health Authorities	0.15	0.23	**0.66**
Municipal and City Administration	0.00	0.36	**0.63**
Sum of Squared Loadings	3.06	1.94	1.82
Cumulative percentage of Variance (%)	34.0	55.0	76.0

Notes:
entries are standardised loadings from an oblimin-rotated principal components analysis.
Based on a correlation matrix using pairwise complete observations.
German residents only.
Source: GESIS Panel Survey, 2020

Appendix 1, Table 4: GLM Multivariate Models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Avoid Places	Social Distance	Handwashing	Reduce Social Contacts	Quarantine (symptomatic)	Quarantine (not symptomatic)	Wear Mask
	logit (SE)	logit (SE)	logit (SE)	logit (SE)	logit (SE)	logit (SE)	logit (SE)
Constant	-.73 (.47)	-.67 (.43)	-.66 (.59)	-.49(.47)	-1.9 (1.1)	**-2.1**[a] (.64)	**-3.7**[a] (1.0)
Trust in Institutions							
Trust in Scientific	**.12**[b] (.04)	.06 (.04)	**.19**[a](.05)	**.15**[a](.04)	-.07 (.10)	.01 (.06)	-.07(.08)
Trust in Political	**.10**[b] (.03)	**.08**[b](.03)	**.11**[c](.04)	**.11**[b](.03)	.01 (.08)	.06 (.04)	.08 (.06)
Trust in Regional	-.01 (.03)	.04 (.03)	-.04 (.04)	**-.08**[c](.04)	-.11 (.08)	-.01 (.05)	-.04 (.06)
Vote Winner (ref: loser)							
Winner	-.17 (.15)	.04 (.13)	.13 (.20)	.06 (.15)	.54 (.38)	-.06 (.19)	-.00 (.28)
Vote Populist (ref: did not vote AfD)							
Vote AfD	.22 (.25)	.39 (.23)	.48 (.32)	.19 (.24)	.94 (.60)	-.01 (.36)	**.83**[c] (.42)
Left-right placement							
left-right	.05(.04)	-.02 (.03)	.03 (.05)	-.02 (.04)	-.10 (.10)	-.04 (.05)	-.05 (.07)
Social Media (ref: did not use)							
Social Media	.29 (.16)	.10 (.14)	.22 (.20)	.05 (.15)	.32 (.35)	.33 (.19)	.14 (.27)
Age (ref 18-30)							
31-40	.31 (.27)	.38 (.24)	-.24 (.36)	**.57**[c](.27)	.26 (.56)	-.59 (.31)	.05 (.72)
41-50	.46 (.27)	.38 (.24)	.37 (.37)	**.59**[c](.26)	-.41 (.61)	**-.75**[c](.31)	.85 (.65)
51-65	**.55**[c] (.25)	**.82**[a](.22)	.39 (.34)	**.81**[a](.25)	-.37 (.56)	**-.67**[c](.28)	.93 (.62)
66 and over	**.73**[c] (.27)	**.93**[a](.24)	.60 (.37)	**.89**[a](.27)	-1.4 (.77)	**-.63**[c] (.31)	.34 (.68)
Education (ref: lower)							
Medium (leaving certificate)	.34 (.22)	-.16(.21)	**.53**[c] (.27)	.39 (.22)	-.91 (.66)	-.31 (.31)	.45 (.50)
Higher (degree)	**.49**[c] (.20)	.31(.20)	**.86**[a] (.25)	**.54**[c](.21)	-.00 (.56)	.00 (.29)	.41 (.49)
Gender (ref: female)							
Male	**-.66**[a] (.14)	-.22 (.12)	**-.54**[b](.18)	**-.51**[a](.14)	.11 (.33)	-.20 (.17)	-.27 (.24)
N	2061	2061	2061	2061	2061	2061	2061
AIC	1658	1927	1075	1577	400	1155	657
Pseudo R^2 McFadden (adj.)	.39	.39	.44	.40	.32	.38	.40
Pseudo R^2 Nagelkerke	.49	.50	.52	.50	.39	.46	.41

Notes: Entries are logits and standard errors rounded to 2 decimal places
[a] p.≤ .001; [b] p.≤ .005; [c]p. ≤ .05
German residents only.
Source: GESIS Panel Survey, 2020

Figure 1: Multivariate Regression Logits of Trust on Compliance (95% Confidence Intervals)

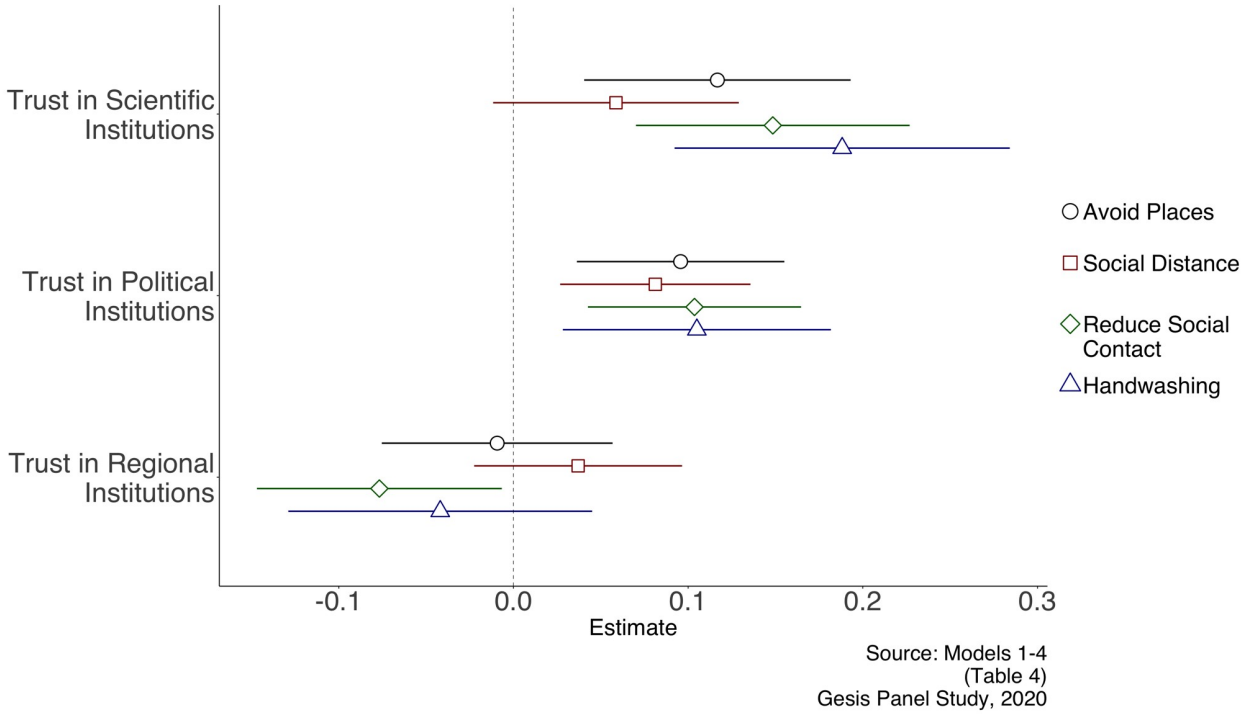


Figure 2: Predicted Probability of Trusting Scientific Institutions and Reducing Social Contacts (95% Confidence Interval)

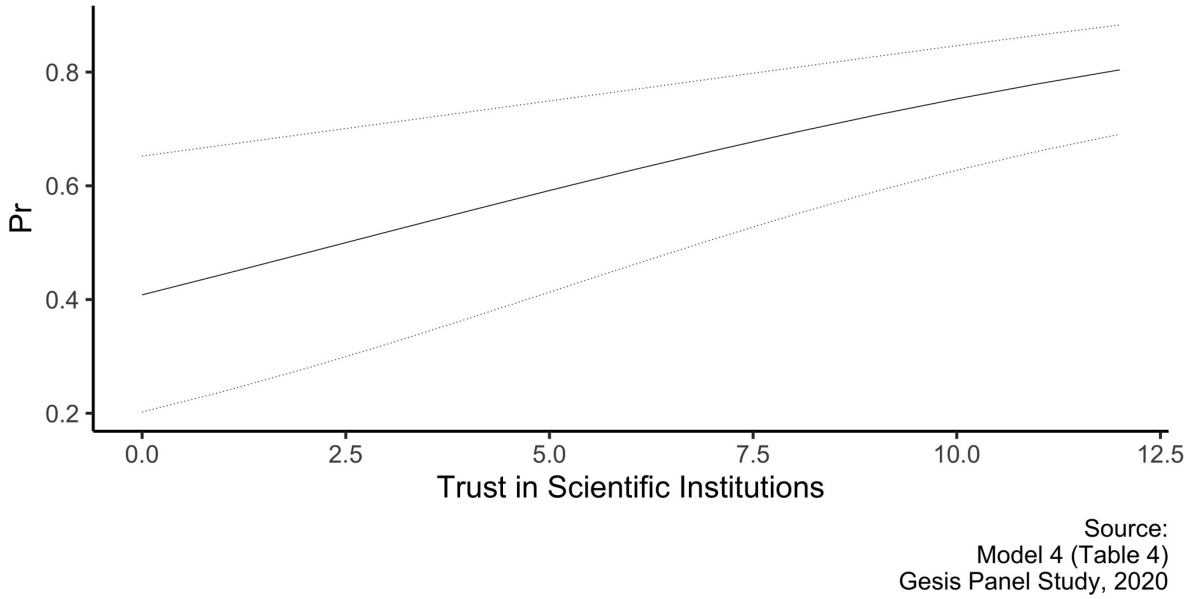
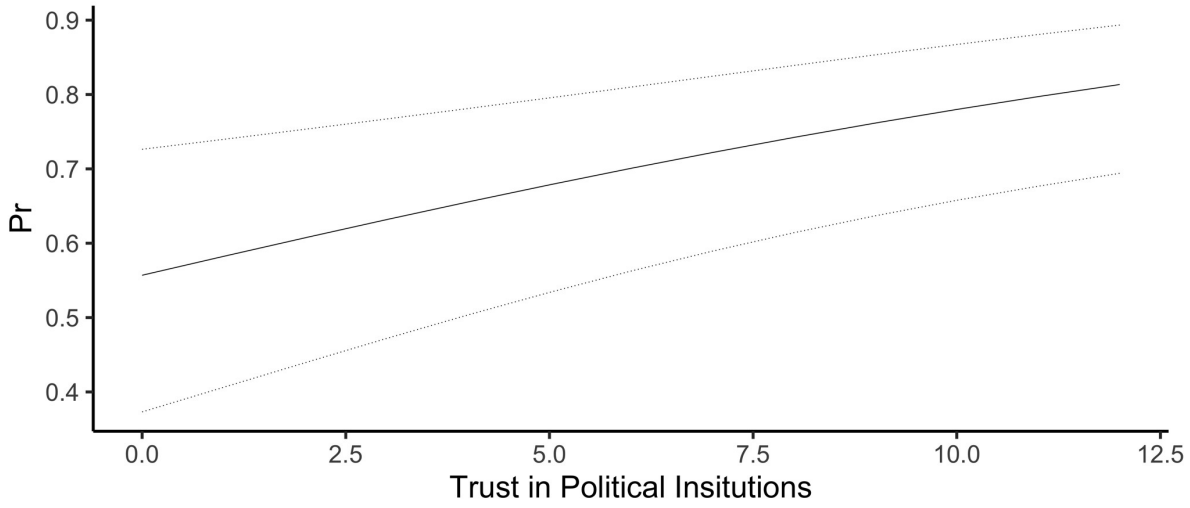
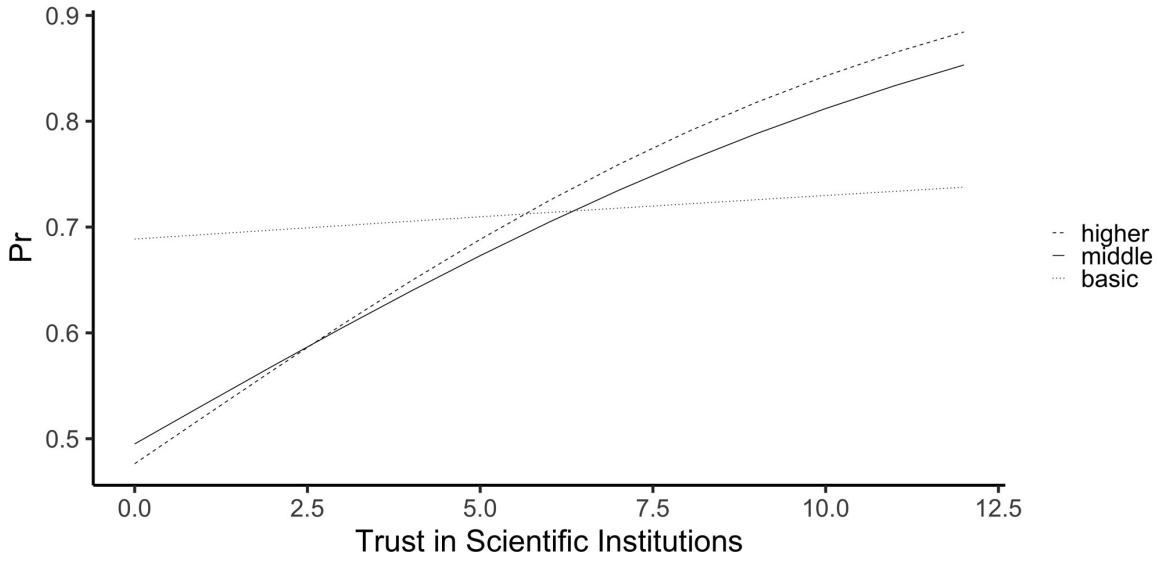


Figure 3: Predicted Probability of Trusting Political Institutions and Reducing Social Contacts (95% Confidence Interval)



Source:
Model 4 (Table 4)
Gesis Panel Study, 2020

Figure 4: Predicted Probability of Reducing Social Contacts by Trust in Scientific Institutions x Education



Source:
Model 4a (Table 5)
Gesis Panel Study, 2020

Appendix 2, Table 5, Multivariate Generalised Models with Interactions

	Model 1	Model 1a	Model 3	Model 3a	Model 4	Model 4a
	Avoid Places	Avoid Places With Interactions	Handwashing	Handwashing With Interactions	Reduce Social Contacts	Reduce Social Contacts With Interactions
	logit (SE)	logit (SE)	logit (SE)	logit (SE)	logit (SE)	logit (SE)
Constant	-.73 (.47)	.63 (.90)	-.66 (.59)	.76 (1.03)	-.49 (.47)	.93 (.89)
Main Effects						
Trust in Institutions						
Trust in Scientific	**.12**[b] (.04)	-.05 (.11)	**.19**[a] (.05)	-.02 (.12)	**.15**[a] (.04)	.02 (.11)
Trust in Political	**.10**[b] (.03)	.12 (.07)	**.11**[c] (.04)	.18 (.08)	**.11**[b] (.03)	.07 (.07)
Trust in Regional	-.01 (.03)	-.01 (.03)	-.04 (.04)	-.04 (.04)	**-.08**[c] (.04)	**-.07**[c] (.03)
Vote Winner (ref: loser)						
Winner	-.17 (.15)	-.16 (.14)	.13 (.20)	.12 (.20)	.06 (.15)	.08 (.15)
Vote Populist (ref: did not vote AfD)						
Vote AfD	.22 (.25)	.22 (.25)	.48 (.32)	.48 (.32)	.19 (.24)	.15 (.24)
Left-right placement						
Left-right	.05 (.04)	.05 (.04)	.03 (.05)	.03 (.05)	-.02 (.04)	-.02 (.04)
Social Media (ref: did not use)						
Social Media	.29 (.16)	.28 (.16)	.22 (.20)	.22 (.20)	.05 (.15)	.04 (.15)
Age (ref: 18-30)						
31-40	.31 (.27)	.31 (.27)	-.24 (.36)	-.24 (.36)	**.57**[c] (.27)	**.57**[c] (.27)
41-50	.46 (.27)	.43 (.27)	.37 (.37)	.37 (.37)	**.59**[c] (.26)	**.59**[c] (.26)
51-65	**.55**[c] (.25)	**.54**[c] (.25)	.39 (.34)	.41 (.34)	**.81**[a] (.25)	**.81**[b] (.24)
66 and over	**.73**[c] (.27)	**.74**[c] (.27)	.60 (.37)	.62 (.37)	**.89**[a] (.27)	**.94**[a] (.27)
Education (ref: lower)						
Medium (leaving certificate)	.34 (.22)	-1.7 (.95)	**.53**[c] (.27)	-1.4 (1.07)	.39 (.22)	-.91 (.95)
Higher (degree)	**.49**[c] (.20)	.13 (.12)	**.86**[a] (.25)	-.06 (1.04)	**.54**[c] (.21)	-1.3 (.91)

Gender (ref: female)						
Male	**-.66**[a] (.14)	**-.64**[a] (.14)	**-.54**[b] (.18)	**-.53**[b] (.18)	**-.51**[a] (.14)	**-.50**[a] (.14)
Interaction effects (Trust xEducation)						
Trust in Scientific x Education (Medium)	--	**.29**[c] (.13)	--	.25 (.14)	--	.12 (.13)
Trust in Scientific x Education (Higher)	--	.13 (.12)	--	.25 (.14)	--	.16 (.12)
Trust in Political x Education (Medium)	--	-.07 (.09)	--	-.05 (.10)	--	.01 (.09)
Trust in Political x Education (Higher)	--	-.003 (.08)	--	-.12 (.10)	--	.05 (.08)
N	2061	2061	2061	2061	2061	2061
AIC	1658	1659	1075	1078	1577	1579
Pseudo R^2 McFadden (adj.)	.40	.40	.44	.44	.40	.40
Pseudo R^2 Nagelkerke (adj.)	.49	.50	.52	.52	.50	.50

Notes: Entries are logits and standard errors are in parentheses.
[a] p. ≤ .001, [b] p. ≤ .005, [c] p ≤ .05.
German residents only.
Source: GESIS Panel Survey, 2020.

Methodological Appendix

Survey Information			
Details	GESIS Panel Survey, ZA5667		
Collection Dates	17/03/20 - 29/03/20		
Method of Collection	Online		
Eligibility	Residents (18 and over)		
Sampling	Convenience (N = 3765)		
Variable Information		**Original Scale**	**Recoding**
Dependent	"Which of these have you done in the last seven days?"		
	Wash hands more frequently	0-1	0-1
	Reducing Contact with People	0-1	0-1
	Avoid Places	0-1	0-1
	Maintaining social distance	0-1	0-1
	Isolating when not symptomatic	0-1	0-1
	Wear face covering	0-1	0-1
	Isolating when symptomatic	0-1	0-1
Independent	"How much do you trust the following people and institutions in dealing with the coronavirus?"		
	Trust in Local Doctor	1-5	0-4
	Trust in Local Health Authority	1-5	0-4
	Trust in Municipal and city administration	1-5	0-4
	Trust in Robert Koch-Institute	1-5	0-4
	Trust in Federal Government	1-5	0-4
	Trust in Chancellor	1-5	0-4
	Trust in Federal Health Ministry	1-5	0-4
	Trust in World Health Organisation	1-5	0-4
	Trust in Scientists	1-5	0-4
Controls			
	Age	10 age categories	30 (or under), 31-40, 41-50, 51-65 66 (and over)
	Education	low, middle and high	1,2,3
	Gender	female, male	0-1
	Vote for Winning Parties (*Sonntagsfrage*)	voted CDU-SPD	0-1
	Vote AfD (*Sonntagsfrage*)	voted AfD	0-1
	Left-right placement	0 (left), 10 (right)	0-10
	Social Media Usage	Use Facebook or Other Social Media	0-1