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## Economic Preferences, Institutional Trust and COVID-19 Health Behaviors

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**Abstract:** To what extent do economic preferences and institutional trust predict compliance with physical distancing rules during the COVID-19 pandemic? We make a distinction between individual health behaviors in the public and the private domain (e.g., keeping a distance from strangers versus abstaining from private gatherings with friends) and examine whether the importance of risk, time, and social preferences as well as trust in science and the government differs across these two domains. Using structural equation modeling to analyze survey data from Germanys second wave of the pandemic (N=3,350), we reveal three major differences: First, reciprocity (especially positive reciprocity) seems essential for individual compliance in the public domain, but barely relevant in the private domain. Second, we find the opposite pattern for individuals' degree of trust in the national government, which appears to matter predominantly for increasing compliance in the private domain. Third, social preferences are generally less important for compliance in the private domain, where individuals' COVID-19-related threat perception is clearly the strongest predictor. From a policy perspective, our findings suggest that communication strategies aimed at spurring compliance may either need to be tailored to domain-specific circumstances or focus on those factors common across domains.

**Keywords:** Health behavior, Compliance, Economic preferences, Institutional trust, COVID-19, Physical distancing

**JEL codes:** D91, H12, H31, I12, I18

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# 1 Introduction

What drives individual compliance with norms, standards, and imperfectly monitored laws and regulations? The importance of this question has long been recognized for general public policy contexts such as tax or fare avoidance as well as for health policy contexts such as vaccination mandates. More recently, the question has gained further significance for COVID-19-related physical distancing - a context in which individual behavior has a very high apparent societal relevance, but the individual and collective short - and long-term consequences of non-compliance are relatively uncertain.[1] These characteristics pose a particular challenge for policy makers because they imply that a substantial amount of variance in compliance behaviors may not be exclusively driven by fully informed, rational cost-benefit considerations. Instead, previous research suggests that compliance behavior in such contexts is shaped to a significant extent by individuals' heterogeneity in economic preferences (i.e., social, risk and time preferences) and their degree of trust in the institutions endorsing the rules (e.g., Keser and Rau, 2023; Cucciniello et al., 2022; Campos-Mercade et al., 2021b; Campos-Mercade et al., 2021a; Chan et al., 2020b; Bargain and Aminjonov, 2020; Shim et al., 2012; Sutinen and Kuperan, 1999).

This paper proposes and empirically investigates a heretofore unaddressed implication emerging from the pronounced influence of these factors on compliance patterns: Compliance behaviors may systematically vary between the public and the private domain, induced by the differential impact of individuals' economic preferences and institutional trust on compliance in these two domains. This is highly relevant in the context of behavioral stipulations to contain the spread of COVID-19, which have included rules governing people's behavior in public spaces, such as requirements to wear masks and maintain physical distance from others, as well as rules governing relatively private behaviors, such as limits to the number of friends with whom to meet at home. While compliance in both the public and private domain is crucial to achieving the overarching objective of these rules, the two domains differ regarding the audiences who might observe and enforce compliance, suggesting potential differing incentive structures.

Against this background, we examined whether such a divergence in compliance behavior exists in the context of COVID-19-related physical distancing rules. Compliance in the public domain here comprised acting in conformity with health guidelines intended to govern behaviors that are easily observable by members of the general public, including public authorities. Examples include wearing a facemask or keeping a physical distance to people from other households in public spaces. Compliance in the private domain comprised behavior consistent with health guidelines intended to govern more private decisions about restricting social contacts and mobility altogether, which is to a large extent observed only by those who also fail to comply. Recognizing and examining a potential divergence in compliance between these two domains is important for advancing our theoretical understanding of compliance in general and moreover highly relevant for public policy in the context of COVID-19. Given a lower COVID-19 vaccine access and coverage in countries of the Global South and the prospect of emerging highly contagious virus variants, lockdown and physical distancing mandates remain crucial tools for containing infection rates in such scenarios.

[1] By uncertainty we mean long tails in the probability distribution, as in what Knight (1921) called 'risk'.

To assess the extent to which economic preferences and institutional trust might differ in their ability to predict health behaviors in the public versus in the private domain, we estimated separate structural equation models of self-reported compliance with nationwide issued physical distancing rules, using original survey data from Germany's second wave of the pandemic in the winter of 2020/21 (N=3,350). As for economic preferences, we examined risk aversion, patience, reciprocity, altruism and civic responsibility. As for institutional trust, we considered COVID-19-related trust in the government and in scientific institutions.

Our results confirm that compliance is significantly correlated with individuals' social and risk preferences and their institutional trust. This finding holds when controlling for COVID-19 threat perception, which was revealed as the strongest predictor of compliance in both domains.

More importantly, our survey data revealed that behavioral patterns differ significantly across the two compliance domains in three ways. First, respondents' level of positive reciprocity was of great importance for compliance in the public domain but barely relevant in the private domain. The same (but slightly weaker) domain-specific differences emerged for negative reciprocity. Interestingly, correlations between reciprocity and compliance were positive in the case of positive reciprocity and negative in the case of negative reciprocity. Second, we also found domain-specific patterns for the degree of trust in the national government and trust in scientific institutions: While trust in the government mattered only for increasing compliance in the private domain, trust in scientific institutions was an important factor in both domains, but significantly more so in the public domain. Third and more generally, our results suggest differences across domains in the relative importance of COVID-19 threat perceptions vis-à-vis preferences and trust. Specifically, the dominance of COVID-19 threat perceptions as the primary predictor of compliance was significantly more pronounced in the private domain. In contrast, individuals' social preferences were more strongly associated with compliance in the public domain.

This analysis contributes to the literatures on the predictors of individual-level outside-the-lab rule and norm compliance in economics, law, political science and psychology in a variety of contexts, including health behaviors during epidemics or pandemics (e.g., Galizzi et al., 2022; Algan et al., 2021; Brodeur et al., 2021b; Blair et al., 2017; Böhm et al., 2016). Furthermore, we contribute to the more specific and recently emerging literature on health behaviors in times of COVID-19. In this literature, social preferences, risk preferences, (to a lesser extent) time preferences, institutional trust, and pandemic-related threat perceptions have been identified both theoretically and empirically as important predictors of various types of compliance behaviors as well as mobility patterns.[2] To the best of our knowledge, this is the first paper to introduce – both in the general

[2]An extensive, but not complete list of conducted works in this regard include Barrios et al. (2021), Campos-Mercade et al. (2021b), Durante et al. (2021), Müller and Rau (2021), Bartscher et al. (2021), Borgonovi and Andrieu (2020), Nikolov et al. (2020), Quaas et al. (2020), Sheth and Wright (2020), and Hulsen et al. (2020) for various types of social preferences; Papanastasiou et al. (2022), Andersson et al. (2021), Müller and Rau (2021), Schunk and Wagner (2021), Alfaro et al. (2022), Chan et al. (2020b), Nikolov et al. (2020), Pullano et al. (2020), Xie et al. (2020), and Xu and Cheng (2021) for risk preferences; Fang et al. (2022), Papanastasiou et al. (2022), Andersson et al. (2021), Müller and Rau (2021), Schunk and Wagner (2021), Alfaro et al. (2022), and Nikolov et al. (2020) for time preferences; Brodeur et al. (2021a), Farzanegan and Hofmann (2022), Fazio et al. (2021), Granados Samayoa et al. (2021), Kazemian et al. (2021), Koetke et al. (2021), Plohl and Musil (2021), Bargain and Aminjonov (2020), Chan et al. (2020a), and Goldstein and Wiedemann (2020) for institutional trust; and Papanastasiou et al. (2022), Algan et al. (2021), Jørgensen et al. (2021), Kluwe-Schiavon et al. (2021), Plohl and Musil (2021), Harper et al. (2020), Vai et al. (2020), and Van Bavel et al. (2020) for COVID-19-related threat perceptions.

as well as in the more specific COVID-19 compliance literature – a conceptual distinction between compliance in the public and the private domain, identify the implications for how compliance might be linked to individuals' economic preferences and institutional trust in distinct ways across the two domains, and systematically examine these potential differences empirically. Our findings suggest that the same individual may exhibit different degrees of compliance across these two domains. They also imply that the effectiveness of policies aimed at spurring compliance will vary across domains – or put differently: distinct policies might be needed to spur compliance in each domain.

The remainder of this paper is organized as follows. Section 2 characterizes the two compliance domains and articulates expectations for (differential) impacts of individuals' economic preferences and institutional trust. Section 3 describes the survey design and the empirical strategy, i.e., the structural equation models. Section 4 presents the main results and robustness checks. Section 5 discusses the broader significance and policy implications.

## 2 Theoretical considerations of a compliance divergence

### 2.1 Characterization of compliance domains

The existing literature on (COVID-19-related) compliance does not distinguish between the public and private domain as spurring distinct logics of compliance. We now turn to this distinction.

Physical distancing rules during the COVID-19 pandemic have in numerous countries called for limiting social contacts and mobility in a variety of ways to reduce the risk of spreading the infection. Some of these rules predominantly govern behavior that inherently takes place in the public sphere, such as requirements or norms to, e.g., wear a mask or keep a certain distance to persons from other households in public transport, at restaurants, in a public park, etc. Violations of these rules are easily observed (and hence enforceable) including by government authorities and by compliant fellow citizens.

Other rules govern behavior that predominantly takes place in the private sphere, e.g., rules asking citizens to restrict private gatherings to a maximum of two households or to only leave the house for necessary daily errands and other urgent reasons. We refer to decisions about complying or violating these rules as compliance in the private domain. Non-compliance with such rules e.g., leaving the house to visit friends for fun instead of leaving the house only to get groceries, or attending or hosting a dinner party with friends from ten different households is not easily observable. Moreover, it is most readily observed, by individuals who have also chosen not to comply with the restrictions (the friends who themselves attend the dinner party).

To that end, the two domains thus vary in terms of the observability of compliance behaviors to certain audiences. This results in differences with regard to (i) the risk of formal (i.e., state) punishment of non-compliant behavior and (ii) the likelihood of social punishment by fellow citizens. Further, the two domains vary by (iii) the degree of social closeness of the people that seem most immediately affected by (non-)compliance (in terms of the medical risk of getting infected with COVID-19). Importantly, note that although compliance decisions across the two domains may

in practice be correlated, they are logically orthogonal in the sense that compliance in any one realm could be practiced regardless of whether one complied with the rules for the respective other domain.

As in (i), the risk of formal punishment, e.g., getting fined for non-compliance, was inherently higher in the public than in the private domain. For instance, mask-wearing was in many places monitored through an increased police presence in subways or crowded city centers, whereas larger-than-allowed gatherings in the privacy of a home was subject only to the much smaller risk of reports by proactive neighbors. Thus, while the amount of fines at the time of data collection was higher for non-compliance in the private domain, the risk of actually getting fined was higher in the public domain (see Table A30). To that end, a recent study suggests that the impact of economic preferences may be sensitive to the existence of government enforcement/punishment in the form of fines, which further strengthens the rationale for the suggested public-private distinction (Papanastasiou et al., 2022).

As in (ii), in terms of social punishment by fellow citizens, the type of audience to potentially execute such a punishment differs between both domains. While in the private realm, observable non-compliance is subjected to disapproval by ones close peers, non-compliance in the public realm is widely observed by the general public. One may argue that social incentives to comply in private settings may for this reason be in principle very strong (see also (iii) below). However, as highlighted above, in contrast to the public domain, compliance in the private domain is directly observed mostly by others who are also non-compliant. Consequently, the likelihood (not necessarily the severity) of social punishment is also assumed to be lower in the private than in the public domain.

As in (iii), the degree of social closeness of the people that seem most immediately affected by (non-)compliant behavior (in terms of the risk of an infection) is higher in the private than in the public domain. Of course, a lack of compliance with the rules in either domain can cause a close family member or friend to get infected through virus transmission. However, this risk is much more salient in compliance behaviors in the private domain, where one directly decides about whether to meet with family and friends. Apart from that, this third distinctive characteristic also suggests that the personal dilemma of whether to comply or not is more substantial in the private domain: Complying means protecting ones closest friends/family but also not being able to maintain close social contact and support them.

## 2.2 Logics of compliance: Distinctive decision-making logics across domains

In the following, we first present theoretically and empirically informed average expectations on how economic preferences and institutional trust may affect COVID-19 compliance overall before we then elaborate on how we expect dynamics to differ across the two compliance domains.

### *2.2.1 Civic responsibility*

Compliance is likely more pronounced among individuals with a higher sense of civic responsibility, as the act of complying with physical distancing regulations during a pandemic resembles an act of civic responsibility (e.g., Barrios et al., 2021). Regarding differential dynamics across domains,

expectations are conflicting: On the one hand, civic responsibility may be a more relevant driver of compliance in the public domain, which is the realm that social or civic duties are mainly associated with. On the other hand, civic responsibility can be viewed as an internalized, intrinsic motivation for compliance, which might thus be more important in the private domain, i.e., in the absence of formal enforcement.

### *2.2.2 Positive and negative reciprocity*

Individuals level of positive and negative reciprocity may also affect compliance behavior: Specifically, in an environment in which compliance is generally high, a person with higher levels of positive reciprocity (i.e., a stronger willingness to return a favor) should exhibit a higher degree of compliance because compliance by others also protects this person and thus may be perceived as a favor to him or her (e.g., Nikolov et al., 2020). In contrast, negative reciprocity (the willingness to punish antisocial behavior) should in expectation not affect ones own level of compliance, because non-compliance as an attempted punishment would, in the pandemic context, also punish those individuals, who contribute to the public good (i.e., compliant individuals). However, one could argue that non-compliant individuals might be punishable to a higher degree by ones own act of non-compliance because compliance also yields self-protection from the virus. This would suggest that individuals with higher levels of negative reciprocity comply relatively less with the imposed rules (e.g., Alfaro et al., 2022). In terms of differential dynamics across the two domains, a persons degree of (positive or negative) reciprocity should matter more for compliance in the public domain. Here, compliance behaviors are much more exposed to and observed by potential reciprocators than in the private domain, i.e., wearing a mask on the train or in the supermarket is observed by a higher number of individuals in comparison to whether a person decides to stay at home alone and not to meet with friends.

### *2.2.3 Altruism*

We generally expect individuals with higher levels of altruism to exhibit higher compliance with COVID-19 rules because those rules aim at reducing the spread of harmful infections among fellow citizens (e.g., Nikolov et al., 2020; Quaas et al., 2020). Pure altruism should not have any differential effects across the two compliance domains, since pure altruism refers to intrinsic values and does not include any reciprocated dynamics or incentives. As long as compliance in the public and private domain more or less equally helps to reduce the spread of the virus, higher levels of pure altruism should increase compliance regardless of whether it is relatively easily observed by others or not. However, given the personal dilemma individuals face in terms of compliance in the private domain, altruism could also have opposing effects in this domain: Altruism might not only call for protecting others from the medical consequences of the virus, but also from the social consequences, i.e., social isolation.

### *2.2.4 Risk preferences*

Risk-averse individuals are expected to comply to a larger degree with physical distancing rules than individuals who are more risk-accepting or risk-seeking because higher compliance lowers the risk of getting infected, as well as the risk of getting fined for non-compliance (e.g., Papanastasiou et al., 2022; Müller and Rau, 2021). Regarding differential effects across domains, we do not have

strong expectations, given that non-compliance in both domains can be characterized as risky behavior, only concerning differing aspects (e.g., the risk of punishment for non-compliance vs. the risk of passing on an infection to close friends or family members)

#### *2.2.5 Time preferences*

We might expect more patient individuals (i.e., with lower discount rates) to exhibit higher levels of compliance as they are more willing to sacrifice a certain immediate reward (e.g., meeting with friends) for a later larger reward (e.g., the end of contact restrictions altogether) (e.g., Alfaro et al., 2022; Papanastasiou et al., 2022). We do not have strong expectations regarding differential effects across the two domains.

#### *2.2.6 Institutional trust*

The government and scientific institutions acted as key endorsers of the social-distancing rules imposed during the COVID-19 pandemic. Therefore, we expect that higher levels of COVID-19-related trust in governmental or scientific institutions spur compliance with physical distancing rules, which is in line with what recent empirical evidence suggests (e.g., Brodeur et al., 2021a; Bargain and Aminjonov, 2020). For trust in the government, conflicting logics make the difference between the public and private realms theoretically indeterminate. On the one hand, trust in the government might have a more pronounced positive effect in the private domain, given that lower levels of monitoring and enforcement by state authorities make trust in the government as an intrinsic motivator more important. On the other hand, an understanding of the private domain as a realm in which the government has inherently no legitimate role to play might make trust in the government less relevant as a predictor. For trust in science, we do not have pronounced differential expectations, though one might argue that its relevance should be stronger in the public domain given the more technical-scientific nature of the stipulations in this realm, e.g., wearing a mask or keeping a 1,50 m distance from another.

## 3 Material and methods

### 3.1 Study setting and sampling

The study was conducted as an online survey between February 3 and March 3, 2021, during the second nationwide COVID-19 lockdown in Germany, which had begun in November 2020. The only stores fully operating at this time were those for daily necessities and medical supplies, while restaurants, retail stores and the like operated at most on a take-away or delivery basis. Physical distancing rules for the second nationwide lockdown were put in place early and were repeatedly renewed, i.e., they remained unchanged during the entire study period and we can expect the vast majority of the population to be aware of their existence.[3] The national and state governments

[3]In addition to the nationwide rules of interest for this paper, there were some minor differences across the German states in the specific rules and recommendations regarding e.g., school/nursery restrictions, contact restrictions for young children and disabled individuals, or the specifics of quarantining after returning from a trip outside Germany (Press and Information Office of the Federal Government, 2021a; Press and Information Office of the Federal Government, 2021b).

met to discuss potential changes in the national lockdown strategy on March 3, which marks the end of the data collection.

The sample consisted of 3,350 respondents recruited from a German access panel maintained by the survey company Respondi. Individuals were eligible to participate in the study if they were at least 18 years old and reported that they had spent the majority of the last two weeks in Germany. Quota sampling was used to obtain a representative sample of the German population with regard to (i) gender, (ii) age group, (iii) education, and (iv) state. Respondents received 'mingle points' (worth between three to five Euros) for participating in the study, which they could redeem in the form of cash, vouchers, or donations.

## 3.2 Survey design and outcome variables

The survey was designed to collect information on the main variables of interest for this study, namely respondents' compliance with national physical distancing rules in Germany as well as their economic preferences and their level of institutional trust. We also collected information about an alternative highly relevant predictor of compliance, namely COVID-19 threat perception, which has been shown to affect (COVID-19) health behaviors (e.g., Papanastasiou et al., 2022; Jørgensen et al., 2021; Kluwe-Schiavon et al., 2021; Plohl and Musil, 2021), and may be correlated with preferences and trust. The survey moreover collected information on a number of additional explanatory variables, including respondents' demographic and socioeconomic characteristics, political and ideological factors, knowledge about the efficacy of different prevention measures to reduce the spread of COVID-19, and a scale to assess possible social desirability bias (Kemper et al., 2012). Tables A1 and A2 in Appendix A summarize all survey items employed in this paper (Table A21 reveals the exact formulation of the survey items as displayed to respondents, translated from the original German version). The full questionnaire, the pre-analysis plan and a rational for deviations from the latter can be retrieved from the supplementary material.

### *3.2.1 Elicitation of compliance behaviors*

Compliance was elicited by asking respondents about their behavior in six situations governed by various physical distancing rules issued by the German national government. In each case, respondents were asked to rate on a scale from 1-5 the extent to which their own behavior in the past two weeks reflected these behaviors (ranging from never to always).

Following the theoretical considerations above, three questions were intended to primarily elicit information about compliance in the public domain, asking respondents about (i) wearing a mask in public transport or when shopping, (ii) keeping the government-stipulated distance of approximately 1.50 meters in public spaces, and (iii) avoiding handshakes when greeting other people. Another three questions were primarily intended to elicit information about compliance in the private domain, asking respondents about (iv) leaving the home only when truly necessary, (v) restricting private meetings to the government-stipulated limit of one person from one other household, and (vi) minimizing interactions with persons from outside one's own households in

general.[4] Importantly, the German federal government's stipulations – and hence the requirements for compliant behavior – were equally clear and stable for the private and for the public domain during the data gathering phase.

### *3.2.2 Elicitation of economic preferences and institutional trust*

With regards to economic preferences, we elicited respondents' level of altruism, positive and negative reciprocity, risk aversion, patience and civic responsibility. To capture institutional trust, we elicited their COVID-19-related trust in the national government and in the Robert-Koch-Institute (RKI), the latter as a proxy for trust in science.

For the majority of these factors (altruism, positive and negative reciprocity, risk aversion, patience), we adapted the items and measurement procedure from the German version of the Global Preference Module (GPSM) (Falk et al., 2016; Falk et al., 2018). Specifically, we used both (i) attitudinal measures that ask about generally behaving in a certain way, as well as (ii) actual incentivized choices (such as donation decisions in the case of altruism or lottery participation in the case of risk aversion). These survey items were standardized and then used to construct one final measure for each preference, based on the weights for the survey items that emerged from the experimental validation procedure by Falk et al. (2018, p.1653).[5] The survey items, weights, final preference measures, and general procedure are summarized in Tables A4 and A5 in Appendix A.[6]

Civic responsibility was measured using (i) respondents' reported voter turn-out in the last national election, (ii) their self-reported tendency (not) to evade fares in public transport, and (iii) their self-reported tendency not to litter. Responses to these three items were used to estimate a factor score of respondents' underlying level of civic responsibility, which we assumed to be the primary common factor among these indicators (for a similar approach, see e.g., Müller and Rau, 2021).

Institutional trust was elicited through questions about respondents' degree of trust in the German national government and their trust in the RKI to adequately manage the pandemic situation. These two institutions were the primary endorsers of physical distancing rules and the main sources of official public health communications during the pandemic in Germany. Throughout the pandemic, the RKI has been the most widely known and recognized German national-level scientific body to conduct epidemiological and medical analyses of COVID-19 and to issue policy recommendations. It thus served as a proxy for trust in science in the German context (Betsch et al., 2021b).

[4]The behaviors and the corresponding questions were adapted from Betsch et al. (2021a) and slightly adjusted. See Table A3 in Appendix A for the exact wording. As part of our robustness checks, we consider an alternative way of distinguishing between compliance in the public and the private realm; see Subsection 4.3.

[5]The experimental validation procedure enabled Falk et al. (2018) to analyze which linear combination of the different survey items performed best in predicting the corresponding behavior in an experimental setting in the lab. We used these same identified weights to form our preference measures. Note that Falk et al. (2018) conducted the validation procedure with a German sample and thus, in the same country context as this study.

[6]For positive reciprocity, we were only able to collect one of the two survey items intended to form the final measure for positive reciprocity. We therefore proceeded with this single item and further assessed the results for robustness when using only a single survey item for all the other preferences as well (selecting the item that had been assigned the highest weight in the experimental validation procedure by Falk et al. (2018)). Our core findings remained robust, see Table A20 and Figure A12 in Appendix A.

#### *3.2.3 Elicitation of COVID-19 threat perception*

COVID-19 threat perception was captured using a battery of questions about (i) how threatening respondents perceived the COVID-19 pandemic to be in general and (ii) how threatening they perceived it to be with regard to specific aspects of their lives, including their own health or the health of those close to them, their financial situation and their social lives. These items were used to estimate factor scores capturing respondents' underlying COVID-19 threat perceptions to be then employed in the subsequent analysis. The majority of the items were adapted from Betsch et al. (2021a).

### 3.3 Data collection and processing

The survey was programmed in German using Qualtrics and piloted with 150 participants. The recruitment for the final survey was conducted by the survey company Respondi.[7] Analyses were performed in R (version 4.1.0) and STATA17. Informed consent was obtained from all respondents before they were presented with the questionnaire, which they could interrupt or exit at any time. As part of the debriefing upon completion of the survey, participants were provided with a substantive list of resources for help and information sources about the COVID-19 pandemic as well as mental health support services.

### 3.4 Empirical strategy

The empirical strategy comprised essentially two steps. First, we examined compliance across the six different physical distancing behaviors to ascertain to what extent there is empirical evidence for the existence of the conceptual distinction between compliance in the private and in the public domain. In view of this, we employed exploratory factor analyses to identify the subsets of physical distancing behaviors that reflect compliance in each domain and then derive initial estimates for compliance in the public and private domain, respectively.

Second, we investigated by means of Structural Equation Modeling techniques to what extent compliance patterns are correlated with individuals' economic preferences and institutional trust for each of the two domains of compliance. Structural Equation Models (SEMs) help to reduce measurement error in the underlying latent variable(s) of interest - here compliance behavior - by combining path analysis (the structural component of the SEM) with confirmatory factor analysis (the measurement component of the SEM) (Acock, 2013). In our case, the Structural Equation Model (SEM) simultaneously (i) fits a confirmatory factor analysis that captures compliance in the public/private domain as a latent variable and (ii) estimates effects of preferences and trust on this latent measure of compliance.

The confirmatory factor analysis (i.e., the measurement component of the SEM) is defined as follows for compliance in each domain $d$, where $d = \{public, private\}$.

$$\boldsymbol{y}_d^{'} = \boldsymbol{\lambda}_d^{'} C_d + \boldsymbol{\epsilon}_d^{'} \boldsymbol{\psi}_d, \tag{1}$$

[7] Prior to the pilot launch in the field, the survey was moreover piloted and discussed in two research design seminars at the authors' university.

$\boldsymbol{y}_d^{'}$ in Equation 1 denotes a vector of the subset of the six observed compliance items that reflect the respective compliance domain, using the results from the exploratory factor analyses in the first step (see Subsection 4.1). $C_d$ denotes the identified latent measure of domain-specific compliance (i.e., the common factor within each item subset), and $\boldsymbol{\lambda}_d^{'}$ is a vector of the regression coefficients of the model, i.e., the factor pattern coefficients (loadings) of the observed items for their respective compliance domain. $\boldsymbol{\epsilon}_d^{'}$ correspond to the unobserved unique factors of the six compliance items and $\boldsymbol{\psi}_d$ are the coefficients relating the unique factors to the items. The variables of interest here are the factors capturing compliance in both domains, $C_d$, which are assumed to induce observed responses to the respective subset of the six compliance items. The latter, $\boldsymbol{y}_d^{'}$, are therefore the dependent variables in the measurement model and constitute the reflective indicators of compliance in each domain (Acock, 2013).

The structural component of the SEM regresses compliance behaviors in each domain (i.e., the latent variables of compliance) on economic preferences and institutional trust, and is defined as follows.

$$C_d = \boldsymbol{P}^{'}\boldsymbol{\alpha}_d + \gamma_d T + \boldsymbol{X}^{'}\boldsymbol{\eta}_d + \boldsymbol{Z}^{'}\boldsymbol{\zeta}_d + \upsilon_d \tag{2}$$

$\boldsymbol{P}^{'}$ denotes a vector of the regression coefficients of preferences and trust on the latent measure of domain-specific compliance, $C_d$. $\gamma_d$ denotes the regression coefficient of COVID-19 threat perception, $T$, as an alternative predictor of compliance in each domain. $\boldsymbol{X}^{'}$ is a vector of demographic and socioeconomic controls, namely gender, age group, state, education, employment in essential services, household size and income, and $\boldsymbol{Z}^{'}$ is a vector of specific compliance controls, namely knowledge about COVID-19 preventive measures and the degree of social desirability bias. $\upsilon_d$ denotes the error term. Individual subscripts are suppressed for simplicity.

The measurement component and the structural component of the SEM are connected through the latent variable, i.e., compliance in the public/private domain, respectively, allowing us to simultaneously estimate the above equations. We estimated the SEM separately for each compliance domain using Diagonal Weighted Least Squares on a polychoric correlation matrix while generating robust standard errors and a corrected test statistic to account for the ordinal and not normally distributed compliance items (e.g., Li, 2016; Finney and DiStefano, 2006).

# 4 Results

Overall, 3,350 respondents completed the online survey, among which 49.85% were female, 49.91% were male, and 0.24% indicated their gender to be diverse. Respondents were on average 47.83 years old. In terms of age, gender, educational attainment, and state of residence our sample was representative of the German population aged 18-74 (see Table A2 in Appendix A). All six compliance items were non-normally distributed and skewed to the left. This means self-reported compliance was generally high, which could be indicative of some social desirability bias in reporting but is not necessarily surprising given that data was collected in the midst of the quite intense second wave of infections in Germany (for a similar finding at that time, see Betsch et al., 2021b). Histograms and density plots of all six compliance items are presented in Figure A1 in Appendix

A. Descriptive statistics for all variables employed in the core analysis are presented in Tables A1[8], A2 and A6 in Appendix A and the screeplots and factor scores of constructing the indexes for COVID-19 threat perception and civic responsibility are shown in Tables A7 to A8 and Figures A2 to A4 in Appendix A[9].

### 4.1 Uncovering the domains: Compliance dimensionality across imposed rules

We first conducted an exploratory unrotated factor analysis and constructed the corresponding screeplot, without restricting the number of factors, to assess the initial dimensionality of compliance behaviors as measured by means of the six physical distancing rules. The screeplot and the polychoric correlation input matrix are shown in Figure A6 and Table A9 in Appendix A. The screeplot suggests that there is one dominating underlying dimension shared among all six items, whereas a potential second, independent (orthogonal) dimension seems much less relevant. This result should not be surprising, given the expectation that compliance in the public and private domain are likely related. Hence, the nature and relevance of each compliance dimension in terms of the factor-specific percent of shared variance explained and factor loadings would become visible only after allowing obtained factors to be correlated.

In view of this, we re-estimated the factor analysis, specifying a two-factor solution, and performed a promax rotation, which allowed obtained factors to be correlated. The promax-rotated 2-factor solution is presented in Table 1 below (see Table A10 in Appendix A for the unrotated solution).

The results suggest a pattern of two underlying factors that are related to each other by a Pearson correlation coefficient of 0.787 and jointly account for more than 70% of the shared variance between all six compliance items. The percent shared variance accounted for is distributed roughly equally between both factors (37.21%; 34.88%). Importantly, each factor seems to relate more strongly to a distinct set of three compliance items. The first factor exhibits strong loadings on the compliance items (i) leaving the home only when absolutely necessary, (ii) restricting private meetings to one person from one other household, and (iii) avoiding other households in general. The second factor exhibits strong loadings on the compliance items (i) wearing a mask in public transport or when shopping, (ii) avoiding handshake greetings and (iii) keeping a distance in public spaces whenever possible. Thus, recalling our theoretical considerations, the first factor seems to

[8] In order to increase the credibility of and validate the main variables of interest for our empirical analysis (i.e., compliance, economic preferences and threat perception), we compare descriptive statistics of our survey data with other representative surveys that collected data on presumably comparable items (COVID-19 Snapshot Monitoring, the World Value Survey and the Global Preference Survey). We generally find a high similarity between our survey data and the other datasets (see Tables A24, A25 and Figure A13), while the similarities are highest for our measures of compliance and threat perception and slightly less so for our measures of economic preferences. Specifically, as intuitively to be expected, the similarity in descriptive statistics is slightly lower, the more a measure deviates from those employed by the Global Preference Survey.

[9] We examine, in an additional analysis, to what extent state-level averaged COVID-19 threat perception is correlated with state-level COVID-19 case incidence rates. For this analysis, we employ data about the COVID-19 incidence date by region (number of registered COVID-19 infections in a state within the past 7 days/100,000 inhabitants) from the COVID-19 dataset by the Federal Statistical Office of Germany ('Statistisches Bundesamt'). We find a positive (statistically insignificant) correlation between COVID-19 case incidence during the time of the data collection and average threat perception at the state level (Pearson correlation coefficient: +0.2928). We, moreover, find a negative (statistically insignificant) correlation between state-level threat perception and the average case incidence in a state throughout the infection waves since the start of the pandemic and therefore also prior to the start of our data collection (Pearson correlation coefficient: -0.3847). See Table A23 in Appendix A as well as Appendix B for a detailed summary and interpretation of results.

reflect compliance in the private domain and the second one compliance in the public domain.

To obtain initial estimates for respondents' level of compliance in the public and private domain, we predicted their factor scores based on the rotated 2-factor solution in Table 1 and additionally constructed summated rating scales using the distinct three-item subset for each compliance domain. A reliability analysis of the constructed scales is presented in Table A11, with Cronbach's $\alpha$ of the scales being as high as 0.797 and 0.780, and $\alpha$ decreasing if any item is removed from the scale (see Figure A7 for an assessment of the monotone homogeneity assumption). As expected, the correlation between the public and private summated rating scale (0.643, see Table A11) was lower than between the factor scores of compliance in both domains (0.787, Table 1), given that each factor here reflects all six items. Density plots and histograms contrasting compliance in the private and public domain as measured by the standardized factor scores and the summated rating scales are shown in Figure 1 below, with higher scores indicating higher compliance.

These preliminary analyses consistently show that, while sharing the same general pattern, compliance patterns were distributed somewhat differently in the two domains. Specifically, the level of compliance in the private domain was generally lower (see mean values in Figure 1) and notably less skewed than that of compliance in the public domain. This suggests that rules governing behavior (and specifically social interactions) in the private realm, such as gatherings with friends in the home, were less complied with than rules governing the public domain. This could be suggestive of a differential nature of individual preferences and trust shaping decision-making in each compliance domain.

**Table 1** Dimensionality in compliance: Promax-rotated 2-factor solution

| | Factor 1 | Factor 2 |
|---|---|---|
| **Compliance in the public domain** | | |
| Wearing a mask in public transport/when shopping | -0.104 | **0.980** |
| Keeping a 1.5m distance in public spaces (whenever possible) | 0.249 | **0.642** |
| Avoiding handshake greetings | 0.321 | **0.633** |
| **Compliance in the private domain** | | |
| Leaving the home only when absolutely necessary | **0.649** | 0.164 |
| Generally avoiding other households | **0.966** | -0.085 |
| Restricting private meetings to one person from another household | **0.653** | 0.100 |
| Eigenvalue | 2.232 | 2.093 |
| Percent shared variance accounted for | 37.21 | 34.88 |
| Multiple $R^2$ of scores with factors: | 0.904 | 0.913 |
| Correlation between factors: 0.787 | | |
| Observations: 3,340 | | |

*Notes:* The table shows standardized factor patterns coefficients from a 2-factor solution of the six compliance items, estimated using iterated principal axis factoring, promax rotation and polychoric correlations.

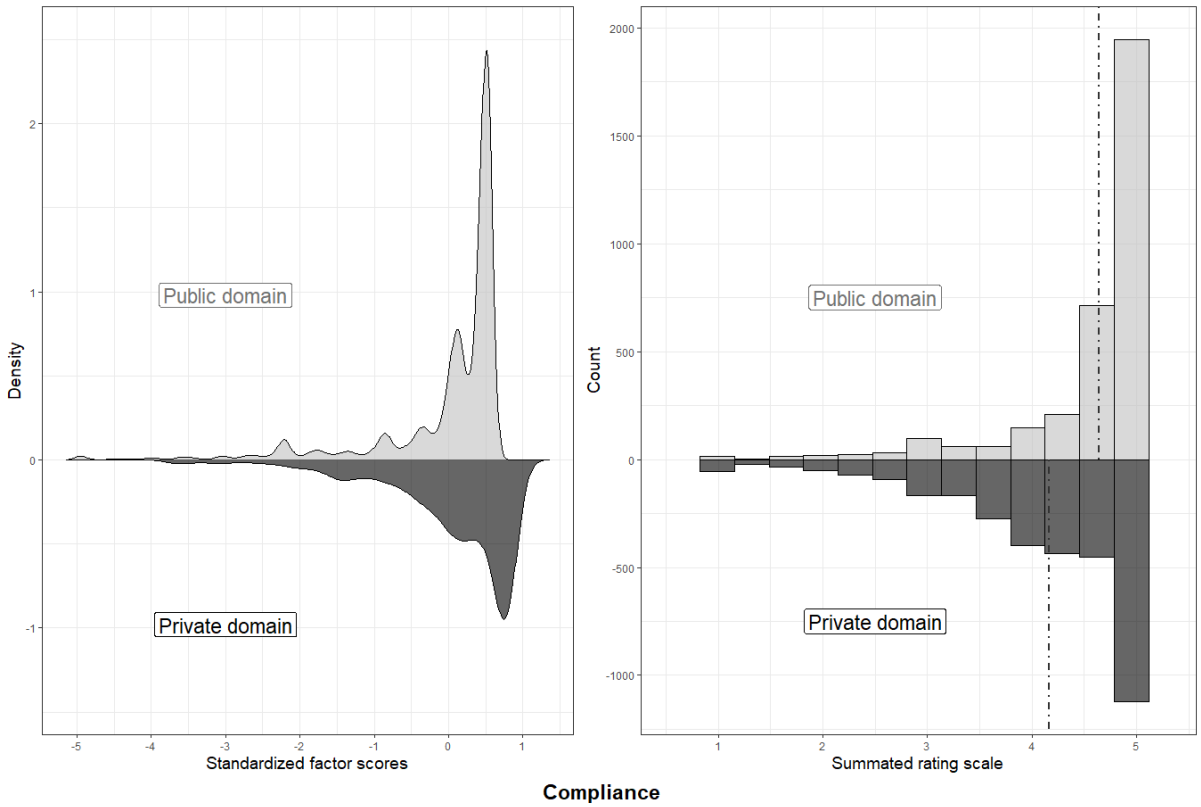


**Figure 1.** Density distributions and histograms of compliance in the public and private domain. *Notes:* This figure shows the distribution of compliance in the public (positive y-axis) and private (negative y-axis) domain, by means of mirrored density plots of the predicted scores from the factor analysis (see Table 1) and mirrored histograms of the constructed summated rating scale (see Table A11). Higher scores indicate higher compliance. The factor analysis constructed standardized values, i.e., factor scores have a mean of 0 and sd of 1. For the summated rating scale, respondents' answers to the identified compliance item triplets of each domain were summed and then averaged. The x-axis thus follows the same scale as the original items, i.e., 5=always complied; 1=never complied with the respective rules). The dotted lines represent the mean of compliance in each domain.

### 4.2 Decision-making patterns across compliance domains

We estimated, for each domain, the Structural Equation Model by means of Equation 1 (the measurement component) and Equation 2 (the structural component) to examine compliance behavior across the public and private domain. The measurement component thereby employed the above-identified subsets of items to form both compliance measures. Its results, shown in Table A12 in Appendix A, revealed strong and statistically significant indicator loadings of all items on compliance in their respective domain. The results of the structural component - i.e., the results of regressing the domain-specific latent measure of compliance on the hypothesized predictors - are presented in Figure 2 and Table 2 below.

Table 2 presents a detailed account of the findings by including the different sets of hypothesized predictors one by one (COVID-19 threat perception, social preferences, risk and time preferences, institutional trust) and adding different sets of control variables. Figure 2 visualizes the coefficient estimates of the final models from 2 (Columns 8 and 16) for both compliance domains in a joint coefficient plot. Both, Table 2 and Figure 2, indicate whether the differences in coefficient estimates

between the domains are statistically significant by means of a Wald test for testing the equality of standardized coefficients (as in Klopp, 2019).

The SEM fit statistics were, for both models, good according to common standards, while slightly better for the model of compliance in the private domain (see Table 2 below). The only statistic that did not meet common standards was the $\chi^2$ test statistic, but this should not be a concern given that its value is inflated by a large sample size and thus extremely sensitive to the model's degrees of freedom, which are quite large in our model.[10] In all figures and tables, we report standardized coefficient estimates.

The findings suggest that respondents' threat perception of the COVID-19 pandemic was overall the most important individual determinant of compliance behavior, both in terms of magnitude and estimated predictive power. Respondents with more pronounced threat perceptions reported on average significantly higher levels of compliance, all else equal. This was the case for compliance in both domains, but to a greater degree for compliance in the private domain ($\beta_{pub}$=0.297, $\beta_{priv}$=0.365; p-values<0.001 each). Respondents' economic preferences and institutional trust played a crucial role for the extent of compliance, revealing a similar directional pattern among the coefficient estimates in both domains.[11] However, while in some cases magnitude and statistical significance of the coefficient estimates were indeed almost identical across domains, they differed substantially and significantly in other cases, according to the results of Wald tests examining the equality of coefficients. In the following, we first report the identified similarities and then turn to the key differences across the two domains.

For civic responsibility, risk aversion, altruism and patience, coefficient estimates did not differ significantly across the two domains (see Table 2, last column). Higher levels of civic responsibility and risk aversion (the former more so than the latter) were correlated with significantly greater compliance to similar extents in both domains (risk aversion: $\beta_{pub}$=0.065, p>0.01, $\beta_{priv}$=0.055, p-value<0.001; civic responsibility: $\beta_{pub}$=0.127, $\beta_{priv}$=0.108 ; p-values<0.001 each). At the same time, respondents' degree of altruism and patience did not seem to be important potential predictors of compliance behavior in either domain.

Importantly, the results from Figure 2 and Table 2 reveal three major differences between compliance patterns across domains, namely with respect to (i) (especially) positive reciprocity, (ii) trust in institutions and (iii) the relative importance of economic preferences and institutional trust as opposed to individuals' threat perceptions as predictors of compliance behavior.

[10] Degrees of freedom for SEMs are differently calculated, (see e.g., Rigdon, 1994).

[11] See Table A16 in Appendix A for the Pearson's correlation matrix of the core explanatory variables, which suggests that we were not facing a case of highly correlated explanatory variables. With the exception of trust in government/trust in the RKI (corr.coeff.: 0.71), all other pairwise correlations were of a low/moderate degree (corr.coeff.:0.01-0.38).

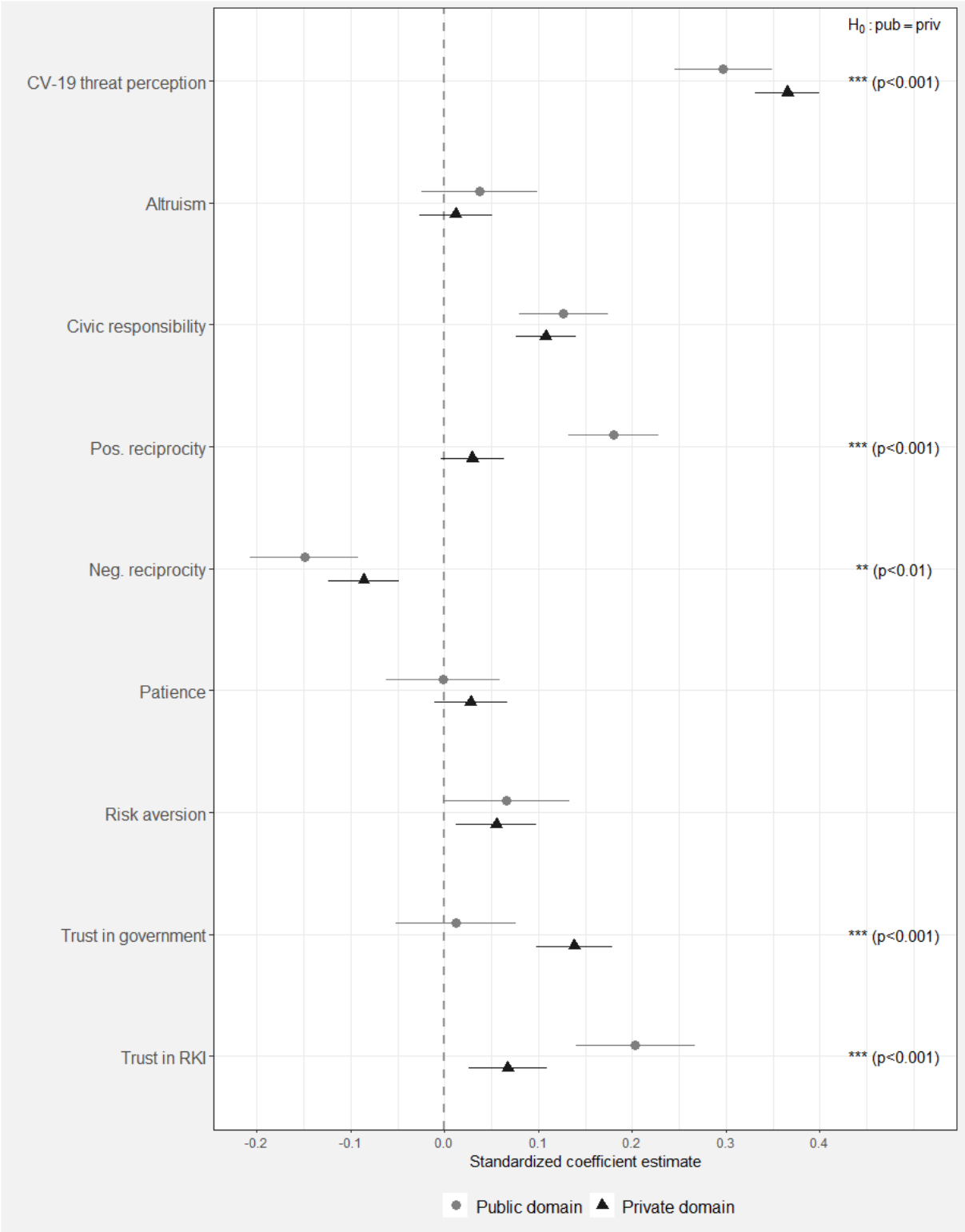


**Figure 2.** Decision-making across compliance domains: SEM results (structural component). *Notes:* This figure shows standardized coefficient estimates and 95% confidence intervals for results of the SEMs estimated by means of Equations 1 and 2 (shown are only the structural component results, see Table A12 for the results of the measurement component). The SEM was estimated separately for each compliance domain, using Diagonal Weighted Least Squares, a polychoric correlation matrix, robust standard errors and a corrected test statistic. Shown are the coefficient estimates for economic preferences, institutional trust and COVID-19 threat perception on compliance in both domains (see Table A13 for full results and precise coefficients). The right column of the figure shows the results of a Wald test for equality of coefficients across the private and public domain (as in Klopp, 2019).

**Table 2** Decision-making across compliance domains: SEM results by submodel (structural component)

| **Outcome** | **Compliance in the public domain** | | | | | | | | **Compliance in the private domain** | | | | | | | | **Wald-Test** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (8)=(16) |
| COVID-19 threat perception | 0.456*** | | | | 0.321*** | 0.304*** | 0.314*** | 0.297*** | 0.486*** | | | | 0.389*** | 0.372*** | 0.382*** | 0.365*** | stat: 11.95 |
| | (0.020) | | | | (0.025) | (0.026) | (0.025) | (0.026) | (0.015) | | | | (0.017) | (0.017) | (0.017) | (0.017) | $p < 0.001$ |
| Altruism | | 0.172*** | | | 0.061** | 0.044 | 0.054* | 0.037 | | 0.133*** | | | 0.031 | 0.017 | 0.024 | 0.012 | stat: 1.40 |
| | | (0.027) | | | (0.030) | (0.031) | (0.030) | (0.031) | | (0.018) | | | (0.019) | (0.020) | (0.019) | (0.020) | $p = 0.237$ |
| Civic responsibility | | 0.200*** | | | 0.174*** | 0.147*** | 0.152*** | 0.127*** | | 0.205*** | | | 0.169*** | 0.127*** | 0.148*** | 0.108*** | stat: 0.84 |
| | | (0.022) | | | (0.023) | (0.024) | (0.023) | (0.024) | | (0.016) | | | (0.016) | (0.016) | (0.016) | (0.016) | $p = 0.360$ |
| Pos. reciprocity | | 0.251*** | | | 0.217*** | 0.205*** | 0.192*** | 0.180*** | | 0.121*** | | | 0.064** | 0.056** | 0.037 | 0.030 | stat: 59.55 |
| | | (0.021) | | | (0.023) | (0.024) | (0.024) | (0.024) | | (0.016) | | | (0.017) | (0.017) | (0.017) | (0.017) | $p < 0.001$ |
| Neg. reciprocity | | -0.194*** | | | -0.185*** | -0.170*** | -0.165*** | -0.149*** | | -0.120*** | | | -0.107*** | -0.103*** | -0.089*** | -0.086*** | stat:9.72 |
| | | (0.026) | | | (0.028) | (0.029) | (0.028) | (0.029) | | (0.018) | | | (0.019) | (0.019) | (0.019) | (0.019) | $p < 0.01$ |
| Risk aversion | | | 0.164*** | | 0.084*** | 0.066** | 0.083*** | 0.065** | | | 0.162*** | | 0.081*** | 0.055** | 0.081*** | 0.055** | stat: 0.23 |
| | | | (0.030) | | (0.033) | (0.034) | (0.033) | (0.034) | | | (0.021) | | (0.021) | (0.022) | (0.021) | (0.022) | $p = 0.630$ |
| Patience | | | 0.148*** | | -0.012 | 0.004 | -0.018 | -0.001 | | | 0.118*** | | 0.013 | 0.032 | 0.009 | 0.028 | stat: 1.88 |
| | | | (0.026) | | (0.029) | (0.031) | (0.029) | (0.031) | | | (0.019) | | (0.019) | (0.020) | (0.019) | (0.020) | $p = 0.170$ |
| Trust in RKI | | | | 0.396*** | 0.222*** | 0.216*** | 0.209*** | 0.204*** | | | | 0.244*** | 0.085** | 0.075** | 0.078** | 0.068** | stat: 25.02 |
| | | | | (0.028) | (0.031) | (0.032) | (0.031) | (0.032) | | | | (0.020) | (0.021) | (0.021) | (0.021) | (0.021) | $p < 0.001$ |
| Trust in government | | | | 0.015 | 0.014 | 0.017 | 0.009 | 0.012 | | | | 0.170*** | 0.135*** | 0.145*** | 0.128*** | 0.138*** | stat: 19.55 |
| | | | | (0.028) | (0.031) | (0.033) | (0.031) | (0.033) | | | | (0.020) | (0.020) | (0.021) | (0.020) | (0.021) | $p < 0.001$ |
| Demogr. & socioecon. controls | No | No | No | No | No | Yes | No | Yes | No | No | No | No | No | Yes | No | Yes | |
| Compliance-specifc controls | No | No | No | No | No | No | Yes | Yes | No | No | No | No | No | No | Yes | Yes | |
| $R^2$ | 0.208 | 0.234 | 0.043 | 0.166 | 0.447 | 0.477 | 0.464 | 0.492 | 0.236 | 0.121 | 0.036 | 0.147 | 0.365 | 0.396 | 0.381 | 0.411 | |
| Observations | 3321 | 3166 | 3096 | 3340 | 2939 | 2918 | 2939 | 2918 | 3321 | 3166 | 3096 | 3340 | 2939 | 2918 | 2939 | 2918 | |
| Full SEM fit statistics (columns 8 \| 16): | **Public** | | | | | | | | **Private** | | | | | | | | |
| | Robust $\chi^2(66) = 156.55; p < 0.001$ | | | | | | | | Robust $\chi^2(66) = 104.25; p < 0.001$ | | | | | | | | |
| | Robust RMSEA = 0.022 | | | | | | | | Robust RMSEA = 0.014 | | | | | | | | |
| | Robust TLI = 0.998 | | | | | | | | Robust TLI = 0.999 | | | | | | | | |
| | Robust CFI = 0.959 | | | | | | | | Robust CFI = 0.987 | | | | | | | | |
| | SRMR = 0.017 | | | | | | | | SRMR = 0.008 | | | | | | | | |

*Notes:* Displayed are standardized coefficient estimates and standard errors in parentheses for the results of the SEM estimated by means of Equations 1 and 2 (shown are only the structural component results, see Table A12 for the results of the measurement component). The SEM was estimated separately for each compliance domain, using Diagonal Weighted Least Squares, a polychoric correlation matrix, robust standard errors and a corrected test statistic. The far right column shows the results of a Wald test for equality of coefficients across the private and public domain (as in Klopp, 2019). Demographic controls contain respondents' gender, age group and state. Socioeconomic controls include education, employment in essential services, household size and income. Compliance-specific controls contain knowledge about COVID-19 preventive measures and the degree of social desirability bias (factor scores as in Figure A8 and Table A15). Table A13 also shows the coefficients of control variables and A14 in the Appendix repeats the same analyses with the final-model sample of N=2918 throughout. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

First, respondents' level of positive reciprocity played a crucial role for compliance only in the public domain, where a one standard deviation increase in positive reciprocity was associated with a 0.18 standard deviation increase in compliance (p-value<0.001). The coefficient estimate was statistically insignificant and small in the private domain ($\beta_{priv}$=0.030; p-value=0.128). An additional Wald test revealed that the difference in coefficients between domains was highly statistically significant (Wald test statistic: 59.55, p-value<0.001). We found the same (but slightly weaker) domain-specific differences for negative reciprocity, only that instead of positive, we reveal negative correlations with compliance behaviors, in line with our theoretical expectations. Specifically, a one standard deviation increase in negative reciprocity was associated with a 0.149 standard deviation decrease in public compliance (p-value<0.001) and with a 0.086 standard deviation decrease in private compliance (p-value<0.001) (Wald test statistic: 9.72, p-value<0.01).

Second, we found opposing patterns for trust in the government and trust in scientific institutions: For compliance in the public domain, trust in the RKI was clearly the dominant determinant in terms of institutional trust. Specifically, a one standard deviation increase in trust in the RKI was associated with a 0.204 standard deviation increase in public compliance (p-value<0.001), while the coefficient for trust in the government was statistically insignificant and small ($\beta_{pub}$=0.012, p-value=0.681). In the private domain, however, both trust in the government and trust in the RKI seem to matter for compliance, the former more so than the latter, with estimated effects between 0.068 (trust in the RKI, p-value<0.01) and 0.138 standard deviations (trust in the government, p-value<0.001). In line with this interpretation, additional Wald tests reject the equality of coefficients of both types of institutional trust across the two domains, suggesting that trust in the government (trust in science) may be more important as a potential predictor for compliance in the private (public) domain (p-values<0.001, see Table 2, last column)[12].

Third, and partially resulting from these first two observations, both the absolute and relative importance of COVID-19 threat perceptions in shaping compliance behaviors differed significantly between the public and private domain: A one standard deviation increase in threat perceptions was associated with a 0.297 standard deviation increase in compliance in the public domain and a 0.365 standard deviation increase in the private domain (both p-values<0.001, Wald test statistic: 11.95, p-value<0.001). In terms of its relative importance, COVID-19 threat perception was the only determinant of this magnitude for compliance in the private domain - the largest magnitude among the estimated effects of the remaining predictors amounts to just slightly more than a third of this value (trust in the government: $\beta_{priv}$=0.138). In contrast, the results from the model of compliance in the public domain seem to reflect a different pattern: COVID-19 threat perception also had the largest predicted influence, but respondents' levels of trust in science ($\beta_{pub}$=0.204) and positive reciprocity ($\beta_{pub}$=0.180) were of a similar importance in terms of magnitude.

[12]We conduct a number of additional analyses with potential proxies for trust in the RKI (trust in science, trust in WHO) and potential channels for trust in the government (trust in state-level government, trust in established media channels) to better understand the differential effects observed for the institutional trust variables. The results reveal that the estimated effects for trust in the RKI are indeed robust, i.e., we observe the same pattern for the utilized proxies: a high, statistically significant relevance in both domains, but more so in the public domain. For trust in the government, the additional analyses seem to suggest that the large, statistically significant estimated effects only in the private domain may be a result of the communication strategy of particularly the national government, whose narrative focused predominantly on the general message to stay at home and isolate (i.e., closely related to our definition of private compliance). See Tables A28 and A29 for details.

Hence, the relevance of COVID-19 threat perception as the primary predictor appears much more pronounced in the private domain, which results in part from reciprocal preferences being significantly more important in the public domain (Wald test statistic: 56.72, p-value<0.001; not in table). In line with this, additional Wald tests also reject the hypothesis that the social preferences considered here have the same impact across both domains (Wald test statistic: 55.85, p-value<0.001; not in table). This interpretation is also reflected in the $R^2$-values: Regressing compliance in each domain purely on the social preference measures yields an $R^2$ of 0.234 in the public domain, but only 0.121 in the private domain (see Table 2, Columns 2 and 10).

Finally, our findings suggest that demographic factors were also significant predictors of compliance whose relevance seems to differ across domains. While female and older respondents reported higher compliance in both domains, gender was the dominating factor in the public domain ($\beta_p ub$ = 0.117, p-value<0.001; $\beta_p riv$ = 0.039, p-value<0.05; Wald test statistic: 14.088, p-value<0.001) and age in the private domain ($\beta_p ub$ = 0.135, p-value<0.001; $\beta_p riv$ = 0.057, p-value<0.05; Wald test statistic: 11.336, p-value<0.001) (see Table A13 in Appendix A)[13]. Socioeconomic factors, namely educational attainment, employment type, household size and income, do not seem to be relevant predictors of (differential) compliance behaviors.

## 4.3 Robustness checks and extensions

### *4.3.1 Self-reported compliance measures and observed mobility patterns*

The measures of compliance in the public and private domain as identified in the main analysis rely on the truthfulness of respondents' self-reports, which may be subject to social desirability bias in reporting. In light of this concern, we assessed the correlation between the SEM-predicted measures for compliance in each domain and Google mobility statistics. To do so, we employed data from Google's mobility reports, which contain phone-tracking-based changes in mobility in several countries and subregions for various types of locations relative to a baseline period before the pandemic (January 3 to February 6, 2020). Types of locations include retail and recreation, grocery stores and pharmacies, parks, transit stations, workplaces, and private residence (Google LLC, 2021).

We calculated the average mobility change for each German state over a period of four weeks (January 20 to February 16, 2021) and correlated these with state-level averages of the SEM-predicted compliance measures from our survey. These four weeks correspond to the period on which the majority of our sample was supposed to have based their compliance reports, as 98.5% of observations were collected between February 3 and 16, and respondents had been told to refer to their behavior during the past two weeks. For the purpose of this exercise, we focused on mobility changes in retail and recreation, transit stations, workplaces, and private residences, as for parks

[13]Our findings for respondents' age align well with those for COVID-19 threat perceptions, which previous studies have found to be stronger among older citizens: Both factors were a stronger predictor of compliance in the private domain. However, the fact that both variables remain statistically significant when added simultaneously suggests that the age effect captures a dynamic that is somewhat distinct from respondents' pandemic-related threat perceptions (e.g., older people being more rule-compliant in general, especially in private settings, while younger people largely comply only when substantially monitored.)

and grocery/pharmacy visits, the expected relation with our compliance measures is ambiguous.[14]

Figure 3 below presents the results of this exercise for each of the compliance measures (public and private) as identified by means of the SEM. Mobility generally decreased in all of the employed location types relative to its baseline level in January/February 2020 (i.e., value changes on the y-axis are negative), except for mobility in residential areas, which increased compared to the baseline (i.e., value changes on the y-axis are positive) and shows that citizens were indeed spending substantially more time in their homes. We found that both compliance measures exhibit the expected relation with changes in observed mobility patterns in the employed location types recorded in the period on which respondents were supposed to base their reports: While standard errors were naturally large given a total number of only 16 federal states in Germany, the Pearson correlation coefficients were clearly positive for residential areas and negative for all other areas. Thus, states with higher reported levels of compliance also showed larger mobility reductions (and vice versa for residential areas). Interestingly, we observed that correlations with compliance in the private domain were in all four types of locations larger in magnitude and showed lower p-value than for compliance in the public domain (the differences in slopes between both domains are, however, not statistically significant). This pattern can be confirmed and becomes even clearer, when instead estimating a regression that includes both compliance measures simultaneously as predictors of mobility changes at the state-level, controlling for population density and whether the state is a city-state (e.g., Berlin, Bremen, Hamburg) (see Tables A26 and A27 in Appendix A).

These findings seem to align with the conceptualization of the two compliance domains: compliance in the private domain would be expected to reduce mobility to a larger extent, given that it relates to people actually reducing their social contacts with other households, and thus, necessarily their movements. In contrast, compliance in the public domain itself would not necessarily relate to mobility changes, as, e.g., wearing a mask or keeping a distance can also be practiced while in transit or the like. The findings strengthen the credibility of the self-reported compliance measures examined in this paper as well as the external relevance of the two domains of compliance behaviors emphasized thereby. Note, however, that the relationships captured in Figure 3 were based on state-level rather than individual-level secondary data from Google's mobility reports.

[14]Mobility changes in going to the grocery store/pharmacy are conceptually unrelated to the compliance items in our survey. Mobility changes in parks would be hard to interpret given very different weather conditions throughout weeks of the year, which predominantly determine outside activities in Germany during these months.

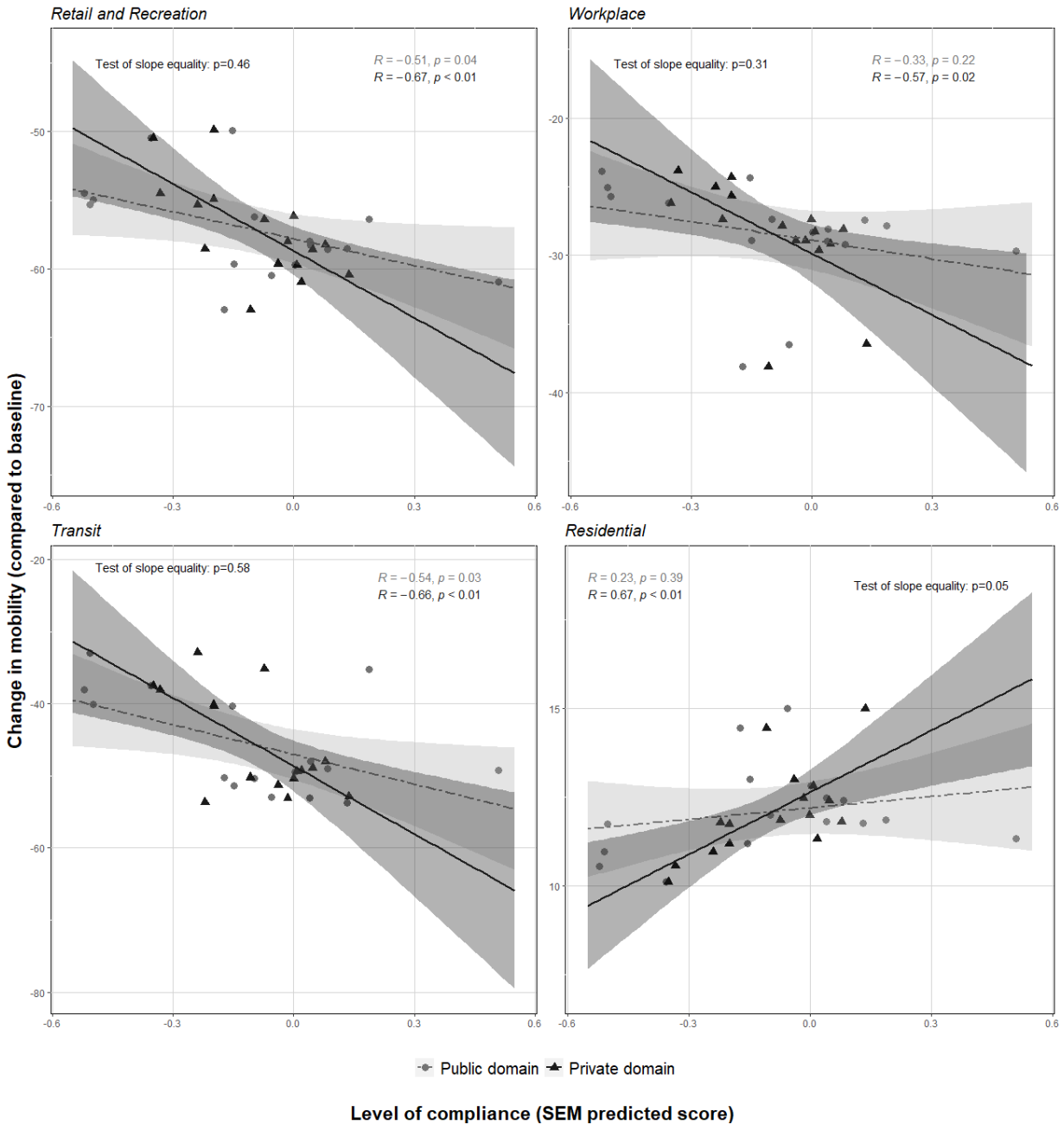


**Figure 3.** External relevance of compliance domains: State-level google mobility patterns. *Notes:* This figure shows scatter plots, linear (with 95% confidence intervals) regression lines, Pearson correlation coefficients, and p-values of (i) compliance in the public and private domain, as predicted from the SEM by means of Equations 1 and 2 (on the x-axis), and (ii) phone-tracking-based changes in mobility according to Google's mobility reports in the areas of Retail and Recreation, Workplace, Transit, and Residential (on the y-axis). Higher values of the SEM-predicted compliance measures indicate higher compliance. In the first three graphs, lower values of mobility changes (i.e., more negative values) indicate stronger reductions in mobility relative to the 2020 baseline period (vice versa for the case of Retail and Recreation). The unit of analysis are the 16 federal states in Germany, given that this is the lowest level of Google mobility reports available for Germany.

### *4.3.2 Additional robustness checks*

We conducted a number of additional analyses to assess the robustness of our results by having a closer look at the dependent variable, i.e., the compliance measures, as well as at the different hypothesized predictors. For the sake of brevity, this subsection merely summarizes the different approaches and their results briefly, while Appendix B contains a more detailed account of the rationale behind the approaches and of their results.

In terms of the elicitation of compliance, we re-estimated the SEM with an alternative measure of compliance in the private domain (i.e., altering the measurement part of the SEM), which we assume is less susceptible to social desirability bias, but still has the advantage of being available at the respondent level (as opposed to the google mobility patterns). For this alternative measure of private compliance, we utilized three questions asking respondents about their willingness to participate in concrete social activities (for more details see Appendix B). The results of this exercise reveal estimates that are similar to the previous ones for compliance in the private domain (and that differ from the ones for public compliance in the same crucial instances), thus, strengthening the credibility of the main results. See Tables A17 and A18 and Figures A9 and A10 in Appendix A for the detailed results of the adjusted measurement model and the structural model of the SEM.

In terms of the different hypothesized predictors, we conducted additional analyses to (i) account for potentially mediating effects of respondents' COVID-19 threat perception (see Table A19 and Figure A11), and (ii) control for two more possibly important competing predictors, namely respondents' degree of generalized interpersonal trust and their residence in urban versus rural areas (see Table A22). As in (i), we argue that individual threat perceptions of the COVID-19 pandemic may themselves be affected by economic preferences and institutional trust (Plohl and Musil, 2021; Harper et al., 2020), therefore suggesting not only direct but also indirect effects of preferences and trust through threat perception. In view of this, we re-estimated the SEM by adding our measure of threat perception as a mediator to the structural component of the SEM. The results suggest that the differences across compliance domains predominantly stem from direct effects - thus, reinforcing the core argument and finding of this paper - while the estimated indirect effects were very similar across domains and in most cases also much smaller in magnitude.

As in (ii), we find that our main results are robust to including a respondent's degree of generalized trust - as measured by means of a survey-based item adopted from Falk et al. (2018) - or their rural as opposed to urban place of residence as additional predictors of public and private compliance. Moreover, our results do not suggest that a rural/urban setting plays a statistically significant role for compliance behaviors in either domain (if any, there is a small negative estimated effect of a rural setting on compliance). Interestingly, we find that generalized trust (the degree to which respondents believe other people to generally have good intentions) significantly decreases compliance only in the public domain, while it has no statistically significant estimated effect in the private domain (see Appendix B for a more detailed discussion of this additional finding).

# 5 Discussion and conclusion

Compliance with expert behavioral recommendations and explicit mandates is crucial for a society's ability to achieve a wide range of public health objectives (and public policy objectives in general), ranging from safeguards for patient privacy or vaccination mandates to requirements for COVID-19-related physical distancing. It is especially crucial when the behavioral stipulations or mandates established by such norms, standards or regulations are only imperfectly enforceable, and compliance depends to a greater and substantive degree on individual choices and considerations about whether to comply. Accordingly, previous research has identified economic preferences and institutional trust as important drivers of individual-level compliance (e.g., Keser and Rau, 2023; Cucciniello et al., 2022; Papanastasiou et al., 2022; Algan et al., 2021; Campos-Mercade et al., 2021b; Campos-Mercade et al., 2021a; Chan et al., 2020b; Bargain and Aminjonov, 2020; Shim et al., 2012; Sutinen and Kuperan, 1999).

In this paper, we have introduced the conceptual distinction between compliance in the public and the private domain and have explored empirically, in the context of compliance with COVID-19-related physical distancing rules, to what extent its correlations with economic preferences and institutional trust differ across the two domains. Understanding individual-level compliance and recognizing potential differences between the private and public domain remains highly relevant in this context. Even though the immediate urgency of the current pandemic may seem to have passed, an increasing likelihood of novel epidemics and pandemics (e.g., Marani et al., 2021) combined with a significant degree of vaccine hesitancy especially towards newly developed vaccines suggests that physical distancing mandates will persist as a crucial part of governments' policy toolkit.

Our fine-grained analysis revealed systematic heterogeneity across the two identified domains, advancing our understanding of compliance and thus providing more tangible grounds for policy interventions. Specifically, while individuals' risk and time preferences appeared to be similarly relevant for compliance across domains, we found significantly different correlations across the two compliance domains in the case of (i) reciprocity (and to some extent also generally for social preferences as a whole), (ii) institutional trust and (iii) COVID-19 threat perception[15].

First, our empirical analyses suggest that relying on, or appealing to, reciprocal dynamics may only be a promising strategy for compliance in the public domain. These results are in line with our theoretical expectation laid out in Section 2: in the public realm, the reciprocation of compliance behaviors (e.g., in the form of wearing a mask in public or only entering an elevator separately) is

[15]Our results are particularly interesting in light of a recent contribution by Papanastasiou et al. (2022): The authors find that economic preferences, specifically, risk and time preferences, become less relevant as predictors of compliance behaviors if respondents are presented with the hypothetical prospect of being fined for non-compliance. While they conducted their data collection at a point in time when fines had not yet been introduced, fines had already come into effect when we conducted our study. The comparison with Papanastasiou et al. (2022) thus seems to permit the following two additional interpretations of our results: First, the fact that we find economic preferences in general to be statistically relevant despite the existence of fees suggests that the estimated effects are rather a lower bound for their relevance in the absence of fees. Second, the finding by Papanastasiou et al. (2022), who examined risk and time preferences in particular, may also serve as a partial explanation for why social preferences as opposed to risk and time preferences are more important for compliance behaviors in our study. This applies especially for compliance in the public realm, which we had not only assigned a larger likelihood of formal (state-) punishment through fines, but also of social punishment to which especially the impacts of social preferences seem to be sensitive.

more observable and, thus, much more salient in people's minds than in the private domain. Here, compliance occurs in the form of staying at home and isolating, but one does not directly perceive others doing the same - at least not to the extent that it is the case in the public realm. This interpretation is moreover supported by the fact that we observed a substantively and statistically much weaker correlation between compliance in the public domain and altruism, which, in its pure form, we had hypothesized and defined without any reciprocal component.

Second, the results reveal somewhat opposing patterns for trust in the national government and trust in scientific institutions (the Robert-Koch-Institut). While the former only seems to matter in the private realm, the latter plays a crucial role in both realms but more dominantly in the public domain. For trust in the RKI, we had weak expectations of a stronger relevance in the public domain as a result of the relatively more technical and specific stipulations in this domain, which may, thus, be more saliently perceived as scientifically validated regulations. We found support for this expectation in supplementary analyses, which reveal the exact same pattern for other proxies of trust in scientific institutions, namely, trust in science in general and trust in the WHO (see Table A28 and Appendix B). For trust in the national government, we had indeterminate theoretical expectations. Additional supplementary analyses exploiting respondents' trust in government-related media channels point to a possible explanation of the high relevance of trust in the national government in the private domain(see Table A29 and Appendix B). The observed dynamic could well be a result of the communication strategies employed by the national government over the course of the pandemic and chancellor Angela Merkel's public addresses urging citizens to stay at home and isolate (i.e., using a narrative along the lines of 'united in separation'). This communication strategy might have worked against the perception of the private realm as a realm in which the government has no prominent role to play, especially for individuals with high levels of trust in the government.

Finally, our findings suggest that policies which succeed in adequately informing individuals about the threat of (the detrimental consequences of) a COVID-19 infection are likely to be highly effective across compliance domains but to an even greater extent in the private realm. Considering the different theoretically outlined characteristics of the two domains, this finding seems plausible. In the private domain, the perceived risk of passing on an infection to a close family member or friend through non-compliance is much more salient than in the public domain. At the same time, the fear of losing a close family member or friend to COVID-19 was one of the most dominant indicators of our measure for COVID-19 threat perception.

This potential for a varying effectiveness of communication strategies across the compliance domains suggests that policy makers may either tailor communications strategies to the circumstances of each domain or focus on the determinants that are common across domains.

We are cautiously referring to our findings in terms of correlations rather than causal effects, given that gathering the data through a cross-sectional survey in the midst of the pandemic did not allow for ensuring exogeneity by design. However, our results remained stable when controlling for various alternative influences and when performing a number of additional robustness checks (see Section 4). Moreover, previous literature seems to suggest that economic preferences and

institutional trust are likely exogenous to the analyses conducted in this paper.[16] In addition, we also acknowledge that our paper only employs self-reported compliance measures and utilizes data from an online survey panel. However, given the various robustness checks conducted to validate the compliance measures and the comparisons of our survey data with other representative non-online surveys, we still believe that our research documents real behavioral mechanisms that can provide useful insights to policy makers. Finally, our paper, strictly speaking, only captures a snapshot of behaviors at the one specific point in the pandemic when the data was collected. Nevertheless, our survey was conducted in the midst of Germany's third wave, and, thus, in the midst of a phase of the pandemic, during which vaccines were not yet available and physical distancing was crucial – which is the exact phase relevant to our research question.

Although we have investigated compliance only in the pandemic context of Germany, the general distinction between compliance in the public and private domain is likely also relevant for other countries that introduced a similar catalog of physical distancing rules. Moreover, the conceptual and empirical contribution of this paper may extend beyond the context of the current and possible future pandemics to other aspects of public policy more generally as well as to health policy in particular. One related example is easily monitorable vs. largely unobserved compliance with different types of hygiene regulations by health personnel/professionals. Another, more general example of a contemporary and very pressing regulatory challenge with similar characteristics are policies encouraging environmentally responsible behavior. A public-private compliance divergence in this context may for instance manifest itself in the differential behavioral predictors of environmentally responsible consumer behaviors in supermarkets versus online shopping with a home delivery option. Finally, our approach also has theoretical relevance for research and established findings on regulatory compliance by challenging the way in which compliance is conceptualized.

[16] Betsch et al. (2021b), Drichoutis and Nayga (2021), Shachat et al. (2021), Angrisani et al. (2020), Bu et al. (2020), Ikeda et al. (2020), Lotti (2020), Groep et al. (2020), Habibpour et al. (2018), Chuang and Schechter (2015), Meier and Sprenger (2015), Carlsson et al. (2014), Volk et al. (2012), and Andersen et al. (2008), please see Appendix B for a structured and more detailed overview of these articles' relevance for our argument.

## References


Acock, A. C. (2013). "Discovering Structural Equation Modeling Using Stata". *Stata Press Books*.

Alfaro, L. et al. (2022). "Health externalities and policy: The role of social preferences". *Management Science* 68(9), 6751–6761.

Algan, Y. et al. (2021). "Trust in scientists in times of pandemic: Panel evidence from 12 countries". *Proceedings of the National Academy of Sciences* 118(40).

Andersen, S. et al. (2008). "Lost in state space: are preferences stable?" *International Economic Review* 49(3), 1091–1112.

Andersson, O. et al. (2021). "Anticipation of COVID-19 vaccines reduces willingness to socially distance". *Journal of Health Economics* 80, 102530.

Angela Merkel, televised speech (2020). [Online; accessed 10-May-2023]. URL: https://www.bundesregierung.de/breg-de/aktuelles/fernsehansprache-von-bundeskanzlerin-angela-merkel-1732134.

Angrisani, M. et al. (2020). "Risk preferences at the time of COVID-19: an experiment with professional traders and students". *Federal Reserve Bank of New York Staff Report* (927).

Bargain, O. and Aminjonov, U. (2020). "Trust and compliance to public health policies in times of COVID-19". *Journal of Public Economics* 192, 104316.

Barrios, J. M. et al. (2021). "Civic capital and social distancing during the Covid-19 pandemic". *Journal of Public Economics* 193, 104310.

Bartscher, A. K. et al. (2021). "Social capital and the spread of Covid-19: Insights from European countries". *Journal of Health Economics* 80, 102531.

Betsch, C. et al. (2021a). *Germany COVID-19 Snapshot MOnitoring (COSMO Germany): Monitoring knowledge, risk perceptions, preventive behaviours, and public trust in the current coronavirus outbreak in Germany - Wave 27*. DOI: 10.23668. URL: https://projekte.uni-erfurt.de/cosmo2020/web/summary/27/.

Betsch, C. et al. (2021b). *Germany COVID-19 Snapshot MOnitoring (COSMO Germany): Monitoring knowledge, risk perceptions, preventive behaviours, and public trust in the current coronavirus outbreak in Germany - Wave 38 Summary*. DOI: 10.23668. URL: https://projekte.uni-erfurt.de/cosmo2020/web/summary/38/.

Blair, R. A., Morse, B. S., and Tsai, L. L. (2017). "Public health and public trust: Survey evidence from the Ebola Virus Disease epidemic in Liberia". *Social Science & Medicine* 172, 89–97.

Böhm, R., Betsch, C., and Korn, L. (2016). "Selfish-rational non-vaccination: Experimental evidence from an interactive vaccination game". *Journal of Economic Behavior & Organization* 131, 183–195.

Borgonovi, F. and Andrieu, E. (2020). "Bowling together by bowling alone: Social capital and Covid-19". *Social Science & Medicine* 265, 113501.

Brodeur, A., Grigoryeva, I., and Kattan, L. (2021a). "Stay-at-home orders, social distancing, and trust". *Journal of Population Economics*, 1–34.

Brodeur, A. et al. (2021b). "A literature review of the economics of COVID-19". *Journal of Economic Surveys* 35(4), 1007–1044.

Bu, D. et al. (2020). "Risk taking during a global crisis: Evidence from wuhan". *Covid Economics* 5, 106–146.

Campos-Mercade, P. et al. (2021a). "Monetary incentives increase COVID-19 vaccinations". *Science* 374(6569), 879–882.

Campos-Mercade, P. et al. (2021b). "Prosociality predicts health behaviors during the COVID-19 pandemic". *Journal of Public Economics* 195, 104367.

Carlsson, F., Johansson-Stenman, O., and Nam, P. K. (2014). "Social preferences are stable over long periods of time". *Journal of Public Economics* 117, 104–114.

Chan, H. F. et al. (2020a). "How confidence in health care systems affects mobility and compliance during the COVID-19 pandemic". *PloS one* 15(10), e0240644.

Chan, H. F. et al. (2020b). "Risk attitudes and human mobility during the COVID-19 pandemic". *Scientific reports* 10(1), 1–13.

Chuang, Y. and Schechter, L. (2015). "Stability of experimental and survey measures of risk, time, and social preferences: A review and some new results". *Journal of Development Economics* 117, 151–170.

Cucciniello, M. et al. (2022). "Altruism and vaccination intentions: Evidence from behavioral experiments". *Social Science & Medicine* 292, 114195.

Destatis Statistisches Bundesamt (2021). [Online; accessed 29-January-2021]. URL: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/_inhalt.html.

Drichoutis, A. C. and Nayga, R. M. (2021). "On the stability of risk and time preferences amid the COVID-19 pandemic". *Experimental Economics*, 1–36.

Durante, R., Guiso, L., and Gulino, G. (2021). "Asocial capital: Civic culture and social distancing during COVID-19". *Journal of Public Economics* 194, 104342.

Falk, A. et al. (2016). "The Preference Survey Module: A Validated Instrument for Measuring Risk, Time, and Social Preferences". *IZA Discussion Papers, No. 9674*.

Falk, A. et al. (2018). "Global evidence on economic preferences". *The Quarterly Journal of Economics* 133(4), 1645–1692.

Fang, X. et al. (2022). "Prosociality predicts individual behavior and collective outcomes in the COVID-19 pandemic". *Social Science & Medicine* 308, 115192.

Farzanegan, M. R. and Hofmann, H. P. (2022). "A matter of trust? Political trust and the COVID-19 pandemic". *International Journal of Sociology* 52(6), 476–499.

Fazio, R. H. et al. (2021). "Who is (not) complying with the US social distancing directive and why? Testing a general framework of compliance with virtual measures of social distancing". *PloS One* 16(2), e0247520.

Finney, S. J. and DiStefano, C. (2006). "Non-normal and categorical data in structural equation modeling". *Structural equation modeling: A second course*. Ed. by G. R. Hancock and R. O. Mueller. Chap. 9, 269–314.

Galizzi, M. M. et al. (2022). "Bandwagoning, free-riding and heterogeneity in influenza vaccine decisions: An online experiment". *Health Economics*.

Goldstein, D. A. and Wiedemann, J. (2020). "Who do you trust? The consequences of political and social trust for public responsiveness to COVID-19 orders". *The Consequences of Political and Social Trust for Public Responsiveness to COVID-19 Orders (April 19, 2020)*.

Google LLC (2021). *Google COVID-19 Community Mobility Reports*. [Online; accessed 09-July-2021]. URL: https://www.google.com/covid19/mobility/.

Granados Samayoa, J. A. et al. (2021). "When does knowing better mean doing better? Trust in President Trump and in scientists moderates the relation between COVID-19 knowledge and social distancing". *Journal of Elections, Public Opinion and Parties* 31, 218–231.

Groep, S. van de et al. (2020). "A daily diary study on adolescents' mood, empathy, and prosocial behavior during the COVID-19 pandemic". *Plos One* 15(10).

Habibpour, M. M. et al. (2018). "How giving affects giving: a long-term analysis of donations". *Applied Economics* 50(21), 2402–2413.

Harper, C. A. et al. (2020). "Functional fear predicts public health compliance in the COVID-19 pandemic". *International Journal of Mental Health and Addiction*, 1–14.

Hulsen, M. van, Rohde, K. I., and Exel, J. van (2020). "Inter-temporal and Social Preferences Predict Compliance in a Social Dilemma: An Application in the Context of COVID-19". *Tinbergen Institute discussion paper 2020-047/I*.

Ikeda, S., Yamamura, E., and Tsutsui, Y. (2020). "COVID-19 enhanced diminishing sensitivity in prospect-theory risk preferences: A panel analysis". *ISER Discussion Paper*.

Jørgensen, F., Bor, A., and Petersen, M. B. (2021). "Compliance without fear: Individual-level protective behaviour during the first wave of the COVID-19 pandemic". *British Journal of Health Psychology* 26(2), 679–696.

Kazemian, S., Fuller, S., and Algara, C. (2021). "The role of race and scientific trust on support for COVID-19 social distancing measures in the United States". *Plos One* 16(7), e0254127.

Kemper, C. J. et al. (2012). "Eine Kurzskala zur Erfassung des Gamma-Faktors sozial erwünschten Antwortverhaltens: Die Kurzskala Soziale Erwünschtheit-Gamma (KSE-G)". *GESIS-Leibniz-Institut für Sozialwissenschaften Working Papers*.

Keser, C. and Rau, H. A. (2023). "Determinants of people's motivations to approach COVID-19 vaccination centers". *Scientific Reports* 13(1), 5282.

Klopp, E. (2019). "A tutorial on testing the equality of standardized regression coefficients in structural equation models using Wald tests with lavaan". *PsyArXiv* 10.

Kluwe-Schiavon, B. et al. (2021). "A behavioral economic risk aversion experiment in the context of the COVID-19 pandemic". *Plos one* 16(1), e0245261.

Knight, F. H. (1921). *Risk, uncertainty and profit*. Vol. 31. Houghton Mifflin.

Koetke, J., Schumann, K., and Porter, T. (2021). "Trust in science increases conservative support for social distancing". *Group Processes & Intergroup Relations* 24(4), 680–697.

Li, C.-H. (2016). "Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares". *Behavior research methods* 48(3), 936–949.

Lotti, L. (2020). "Generosity and stability of social preferences: the effects of negative socioeconomic shocks and framing".

Marani, M. et al. (2021). "Intensity and frequency of extreme novel epidemics". *Proceedings of the National Academy of Sciences* 118(35), e2105482118.

Meier, S. and Sprenger, C. D. (2015). "Temporal stability of time preferences". *Review of Economics and Statistics* 97(2), 273–286.

Müller, S. and Rau, H. A. (2021). "Economic preferences and compliance in the social stress test of the COVID-19 crisis". *Journal of Public Economics* 194, 104322.

Nikolov, P. et al. (2020). "Predictors of Social Distancing and Mask-Wearing Behavior: Panel Survey in Seven US States". *Human Capital and Economic Opportunity Working Group*.

Papanastasiou, A., Ruffle, B. J., and Zheng, A. (2022). "Compliance with social distancing: Theory and empirical evidence from Ontario during COVID-19". *Canadian Journal of Economics/Revue canadienne d'économique* 55, 705–734.

Plohl, N. and Musil, B. (2021). "Modeling compliance with COVID-19 prevention guidelines: The critical role of trust in science". *Psychology, Health & Medicine* 26(1), 1–12.

Press and Information Office of the Federal Government (2021a). *Coronavirus in Deutschland*. [Online; accessed 19-September-2021]. URL: https://www.bundesregierung.de/breg-de/themen/coronavirus/corona-diese-regeln-und-einschraenkung-gelten-1734724.

Press and Information Office of the Federal Government (2021b). *Regeln in den Bundesländern*. [Online; accessed 19-September-2021]. URL: https://www.bundesregierung.de/breg-de/themen/coronavirus/corona-bundeslaender-1745198.

Pullano, G. et al. (2020). "Evaluating the effect of demographic factors, socioeconomic factors, and risk aversion on mobility during the COVID-19 epidemic in France under lockdown: a population-based study". *The Lancet Digital Health* 2(12), e638–e649.

Quaas, M. et al. (2020). "The Social Cost of Contacts: Theory and Evidence for the Covid-19 Pandemic in Germany". *CESifo Working Paper No. 8347*.

Rigdon, E. E. (1994). "Calculating degrees of freedom for a structural equation model". *Structural Equation Modeling: A Multidisciplinary Journal* 1(3), 274–278.

Schunk, D. and Wagner, V. (2021). "What determines the willingness to sanction violations of newly introduced social norms: Personality traits or economic preferences? evidence from the COVID-19 crisis". *Journal of Behavioral and Experimental Economics* 93, 101716.

Shachat, J, Walker, M., and Wei, L (2021). "How the onset of the Covid-19 pandemic impacted pro-social behaviour and individual preferences: Experimental evidence from China". *Journal of Economic Behavior and Organization.* 190, 480–494.

Sheth, K. and Wright, G. C. (2020). "The usual suspects: do risk tolerance, altruism, and health predict the response to COVID-19?" *Review of Economics of the Household* 18(4), 1041–1052.

Shim, E. et al. (2012). "The influence of altruism on influenza vaccination decisions". *Journal of The Royal Society Interface* 9(74), 2234–2243.

Sutinen, J. G. and Kuperan, K (1999). "A socio-economic theory of regulatory compliance". *International Journal of Social Economics* 26(1-2), 174–193.

Vai, B. et al. (2020). "Risk perception and media in shaping protective behaviors: insights from the early phase of COVID-19 Italian outbreak". *Frontiers in Psychology* 11.

Van Bavel, J. J. et al. (2020). "Using social and behavioural science to support COVID-19 pandemic response". *Nature Human Behaviour* 4(5), 460–471.

Volk, S., Thöni, C., and Ruigrok, W. (2012). "Temporal stability and psychological foundations of cooperation preferences". *Journal of Economic Behavior & Organization* 81(2), 664–676.

Xie, K. et al. (2020). "The impact of risk perception on social distancing during the COVID-19 pandemic in China". *International Journal of Environmental Research and Public Health* 17(17), 6256.

Xu, P. and Cheng, J. (2021). "Individual differences in social distancing and mask-wearing in the pandemic of COVID-19: The role of need for cognition, self-control and risk attitude". *Personality and individual differences* 175, 110706.

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Angerer, Silvia, Glätzle-Rützler, Daniela, Lergetporer, Philipp, and Thomas Rittmannsberger. ”Beliefs about social norms and (the polarization of) COVID-19 vaccination readiness”, MPPE No. 01/2023, Munich. (ISSN)2701-3456

Blesse, Sebastian, Lergetporer, Philipp, Nover, Justus, and Katharina Werner. “Transparency and Policy Competition: Experimental Evidence from German Citizens and Politicians”, MPPE No. 02/2023, Munich. (ISSN)2701-3456

Sternberg, Henrike, Steinert, Janina Isabel, and Tim Büthe. “Compliance in the Public versus the Private Realm: Economic Preferences, Institutional Trust and COVID-19 Health Behaviors ”, MPPE No. 03/2023, Munich. (ISSN)2701-3456


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