Emergence of and compliance with new social norms: The example of the COVID crisis in Germany

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Abstract
In crisis situations, people have to change their behavior. A collective learning process begins and new patterns of order emerge. Externalities of behavior lead to the emergence of new social norms. But are the social norms also followed? A closer examination must take into account the different character of social norms. Following the theory of Ullmann-Margalit, coordination norms or conventions have different consequences for norm-oriented behavior than cooperation norms. This distinction is also important for lawmaking. There is no “free-rider problem” with coordination norms, but there is one with cooperation norms. This paper examines the question of the characteristics of new norms which emerged during the first wave of the COVID-19 crisis, such as the requirement for distance, the obligation to wear masks and cooperation in the digital tracing of infection chains. This study is based on how Germany has coped with the first wave of the pandemic in spring 2020. However, the analysis leads to conditions which in general may explain the degree of compliance with different types of new social norms.
Keywords
Conventions, cooperation problem, coordination problem, emergence of norms, face masks, norms in corona pandemic, social dilemma, social norms

Introduction
The threat of the COVID-19 virus has brought about new norms such as hygiene rules, distance requirements, and the wearing of protective masks. The etiquette of greeting rituals has also changed. When handshaking or hugging were common forms of greeting in one culture, these gave way to other rituals. New social norms often emerge in times of upheaval, in crisis situations, because then it is a matter of balancing newly created conflicts of interest. The new norms serve to regulate “negative externalities,” the virus transmission that can occur whenever two or more people meet. They are intended to reduce the risk of infection and thus contribute to the collective good of “protection of health,” but at the same time they have disadvantages in that they impose serious restrictions on customary behavior. However, the norms have different characteristics, which also lead to different levels of compliance. As fears of contagion have grown, distance rules have spread relatively rapidly. Why was the same not true for wearing masks in public? Even when infection levels were high, face masks (“every day masks,” medical masks) were rarely seen in retail stores, on public transportation, or at larger gatherings in Western countries. Cultural reasons were also cited for this. Wearing masks fits the collectivist culture of Asian societies; the individualistic culture of the West, on the other hand, inhibits the social diffusion of the norm (Zheng, 2020). Only after the relatively late introduction of the mask requirement in most Western countries did it become apparent that the vast majority of people were nevertheless quite quickly prepared to change their behavior. The norm was highly accepted despite “corona protests” by a small minority of COVID deniers.

Certain norms spread rapidly while others meet high resistance. An explanation of the emergence of norms and the degree of compliance, which is the primary concern here, requires that the underlying structure of action and the particular type of norm can be identified. In particular, in situations of cooperation problems where self-interest is not in accordance with general welfare, the prospects that norms will be followed voluntarily are low. The situation is different for social norms or conventions that coordinate behaviors. An exemplary work that draws on simple bi-matrix games from game theory is Mackie’s (1996) study of the centuries-long persistence and sudden change of the norm of foot binding widely practiced in ancient China. This practice of cruelly mutilating the feet of young girls was practiced by tacit agreement without state coercion, according to Mackie’s (1996) thesis.
Today, the COVID crisis provides rich illustrative material for studying the emergence of and adherence to norms of coordination of actions and norms of cooperation.

Following the classic theory of Ullmann-Margalit (1977), the aim of this essay is to highlight the different character of social norms, to show the consequences, and to relate them to norms newly emerged in the Coronavirus pandemic. The key distinction between coordination and cooperation norms is elaborated here for the situation at the beginning of the pandemic in spring 2020 in Germany. Handshaking was more common in Germany than in other countries. Cultural differences may play a role, but the consequences of distinguishing between different types of norms are likely to be relevant for other countries as well. The focus of this study is the first Coronavirus wave in Germany because this was the relevant “window of observation” for the emergence of new norms and massive behavioral change.

As will become apparent in the following section, the distinction is not only matter of definition, but also has consequences for the adherence to and stability of norms. It is also important for policy issues and lawmaking. The Section New Social Norms in the Coronavirus Pandemic illustrates the consequences by looking at behavioral norms in the COVID crisis and supporting the conjectures with available empirical material from German survey data. The Section Tracing Apps as a Collective Good and Contribution Game looks at tracing apps installed on smartphones to inform about contacts with infected individuals. Some consequences are discussed in conclusion.

Types of norms: Coordination, cooperation, inequality

“Norm-prone” conflict situations can be described precisely using the tools of game theory. In such situations, the actions of each actor are interrelated; the outcome of one actor’s action depends on the actions of the other actors. One can also say that every action of an actor has negative or positive externalities to the detriment or benefit of other actors.

Unregulated negative (or even positive) externalities are virtually the breeding ground for the emergence of social norms\(^1\) (Coleman, 1990; Demsetz, 1967; Opp, 1983; Voss, 2001). Coleman (1990: 241) speaks of “a demand for effective norms.” If ego’s action violates alter’s interests, that is, ego’s action constitutes a negative externality from Alter’s point of view, then the conflict of interests can be resolved by a social norm that stops or compensates for the negative externality. New social norms thus arise (a) from newly emerging externalities (e.g., to regulate the consequences of new technologies) or (b) also from the re-evaluation of actions as harmful, negative externalities (e.g., from new knowledge or new value priorities).
the dangers of secondhand smoke came increasingly into focus, so did the commitment to regulate through smoking bans.

Externalities, however, are neither sufficient nor necessary to give rise to social norms. Other reasons can also lead to the emergence of new social norms. In Ellickson’s (1994) studies, the reduction of transaction costs through social norms plays a key role; in Posner (2000), social norms signal personal characteristics such as trustworthiness and cooperativeness. Not all norms originate in the regulation of externalities. Piercing, fashion, or demonstrative consumption through status goods cannot be explained by the “externality hypothesis” (Opp, 2018; Przepiorka and Diekmann, 2013, 2021). Moreover, the mere fact that negative externalities exist does not automatically lead to the emergence and acceptance of norms (Coleman, 1990; Voss, 2001). If contagious diseases such as measles can be controlled through vaccination, the introduction of mandatory vaccination is likely, but not guaranteed. Street noise harms residents’ health, but whether it is limited by social norms depends on the power and influence of those involved in the political process. Other factors must also come into play for a norm to emerge by legal act or evolutionarily (Opp, 1982; Young, 1998) and meet with acceptance. Nevertheless, it may be argued that externalities very often form the starting point for a process of emergence of new social norms.

This is undoubtedly true for an emerging epidemic against which there is initially no immunity in the population. Any infected person can transmit the virus, and in the case of COVID-19, the carrier does not even know that she or he is potentially endangering other people, that is, the actions can trigger negative externalities.

The analysis of interrelated, “interdependent” actions is the domain of game theory. By definition, a game model takes into account the negative or positive externalities of the actors. Ullmann-Margalit (1977) also assumes simple game situations. The distinction between coordination problems and cooperation problems and the corresponding game models is central. In “pure” coordination games, the actors have completely coinciding interests, but they have to coordinate their decisions in order to reach “good” results. A typical example is the decision in traffic to drive on the right or on the left. There are four options for ego and alter: “right/right” and “left/left” are (Nash) equilibria in this context, which undoubtedly produce better results than a collision course. The social norm is a commitment to one of the equilibria. One can also speak of “conventions” (Lewis, 1969). Thus, coordination norms are social norms that specify one of several equilibria in a coordination game. The norm does not necessarily have to come about by setting on the part of an authority. Coordination norms can also emerge evolutionarily. In fact, right and left driving laws in road traffic initially emerged evolutionarily, as Young (1998) has demonstrated with historical examples. Coordination games can also have a more complex structure, with
a variety of equilibria that are differentially favorable to the participants. The situation of a common deer hunt already mentioned in Rousseau’s essay “On the Origins and Foundations of Inequality Among Men,” a parable of increasing welfare through social cooperation, can be represented as a coordination game (“stag-hunt game”) with two equilibria that are differently favorable (Ullman-Margalit, 1977). Courtesy norms coordinate equilibria when passing a bottleneck according to age or gender; a traffic light sets a social norm that “selects” an equilibrium for road users at each intersection. As this “chicken game” is repeated frequently with different players, each “player” receives the same payoff on average. The norm is fair and ensures optimal outcomes.

However, many problems in social interaction cannot be solved by coordination norms alone. In cooperation dilemmas, the prime example being the prisoner’s dilemma, the actors achieve a “worse” result in equilibrium than in mutual cooperation. The prisoner’s dilemma is just a metaphor; there are many different structures of social dilemmas, some of which require highly sophisticated models to analyze (Raub et al., 2015). Consider climate change; ultimately a cooperation dilemma with very many actors and very different interests (the game structure is then more complex; see e.g., Przepiorka and Diekmann, 2020). Also, vaccination can be considered as a cooperation dilemma (Korn et al., 2020). Here, however, we are concerned with the basic principles, so simple situations will suffice as illustrations.

Littering, fare evasion, refusing vaccination for contagious diseases, tax evasion, overfishing of the oceans, and others are non-cooperative strategies in social dilemmas. Individually, actors benefit compared to cooperative individuals. But overall, everyone loses when very many or all actors join the non-cooperative strategy. The individually rational strategies lead to a “bad,” inefficient equilibrium. A cooperation norm shows a way out of the dilemma. It obligates to cooperative behavior. However, each actor has an incentive to violate the norm. Only the possibility of sanctions, a credible threat of sanctions, or a positive sanction rewarding cooperative behavior gives the norm validity. In game-theoretic terms, the threat of sanction enables a cooperative equilibrium (Figure 1). The sanction can be social disapproval, a fine, and so on, or the intrinsic punishment of a guilty conscience.

The central difference to coordination norms is obvious. Coordination norms are self-enforcing. Actually, no additional threat of punishment is needed to enforce the right-hand-drive rule. The choice of equilibrium strategy is in one’s self-interest and at the same time in the collective interest.

In the case of cooperation norms, it is the other way around. In a cooperation dilemma, self-interest and “collective rationality” (Rapoport, 1988) are not congruent. No state has yet managed to generate tax revenue by voluntary spending of citizens. Cooperation norms aim at producing
collective rationality. The distinction between coordination and cooperation norms is also significant for political practice. Of course, it is much easier to enforce coordination norms than to enforce cooperation norms.

The differences between coordination and cooperation norms are clearly presented in Table 1. Adherence to norms of cooperation, by definition, contributes to a collective good. Compliance with coordination norms can also simultaneously promote a collective good. For example, coordination rules in road traffic increase the collective good of road safety. Although compliance is in self-interest, coordination norms are also often subject to external sanctions. One reason for this is that there may always be some actors who, for example, have a situational interest in violating the coordination norm or negligently deviate from the norm. Moreover, repeated action in accordance with coordination norms may intrinsically reinforce compliance (Guala and Mittone, 2010). The equilibrium established by the coordination norm need not always be “efficient.” Especially in the evolutionary development and propagation of norms, this process can lead to the trap of a “bad” equilibrium. Mackie’s (1996) analysis of the norm of foot binding in China, mentioned at the outset, is an example of this. 

Figure 1. Cooperation problem and cooperation norms. The more people cooperate, the higher the individual profit for each actor. A free rider, however, always makes an extra profit. This can be illustrated by a simple example (Rapoport, 1988). Actors can choose between K and T. Let x be the number of cooperative actors who choose K. The cost of cooperation is one unit. A cooperative actor gets \( K = 2x + 2 \); a free rider gets \( T = 2x + 3 \). T is a dominant strategy; a free rider is always better off whether the others cooperate much or little. If now all actors apply the free-rider strategy, the “defective” equilibrium is attained. Cooperation norms make it possible to achieve the collective optimum. Threats of sanctions and the internalization of norms shift the “free-rider line” downward. If it is below the cooperation line, the collective optimum becomes the new equilibrium.
|                     | Actor’s compliance is self-interested<sup>a</sup> | Actor’s compliance is not self-interested<sup>a</sup> | Sanctions                     | Type of interaction                                  | Example                          |
|---------------------|-------------------------------------------------|-------------------------------------------------|--------------------------------|---------------------------------------------------|---------------------------------|
| Coordination norm   | +                                               | –                                               | Self-sanctioning              | Coordination game. Social norm determines equilibrium. | Right-hand-driving, distance rule in epidemic |
| (“convention”)      |                                                  |                                                  |                                |                                                   |                                 |
| Cooperation norm    | –                                               | +                                               | Compliance requires external or intrinsic sanctions or rewards | Social dilemma: Equilibrium is suboptimal (“inefficient”) | CO2 emission reduction, Mask wearing |

<sup>a</sup>Before implementation of sanction threat.
Further, there may be mixed forms of cooperation, coordination, and distribution problems. Finally, cooperation norms may be followed in self-interest if there are, in the language of Olson (1965) - sufficiently strong “selective incentives.” Selective incentives can also be set by institutions to mitigate a social dilemma. When the two types of norms are contrasted in Table 1, they are virtually “pure” norms of coordination and cooperation. One could also speak of “ideal types” in the sense of Max Weber.

Ullmann-Margalit (1977) further discusses a third category of social norms, namely, norms of “partiality.” These norms concern unequal distributions of resources. The norm “A divides the cake, B chooses” is a prime example of a wise norm that realizes distributive justice quasi automatically. This is not guaranteed in politics and economics. It is clear that the distribution of resources is of eminent importance in the political process, in economic activities, but equally in everyday actions. Here, let us just say that coordination and cooperation norms can also touch distributional problems. Not all dilemma situations are symmetrical. Norms of coordination and cooperation can impose different costs depending on social situation or demographic characteristics. This is also evident in the COVID crisis. Moreover, the probability of infection, the severity of the disease, and the risk of falling victim to the disease also depend not only on age, but also on social position or minority membership (Eligon et al., 2020). The ‘virus is not democratic’!

**New social norms in the coronavirus pandemic**

Following the global spread of the pandemic, most countries adopted rigid measures to contain it. The so-called non-pharmaceutical measures consisted of more or less strictly enforced hygiene rules, contact distance bans, assembly bans, school and business closures, obligatory or recommended home office work, contact bans and travel restrictions, mandatory use of masks, and tracking of infection chains using manual or digital methods, plus extensive testing programs. Often cited prime examples of successful covid prevention strategies are Taiwan and South Korea, where politicians and the population also benefited from experience with previous epidemics. A systematic investigation of the causal effectiveness of individual measures poses several methodological problems for research. Cross-country comparisons must take into account numerous factors, such as the quality of the health care system, population density, age of the population, etc., in order to provide even approximately reliable estimates of the effectiveness of individual measures (e.g., Castex et al., 2021). Apparently important is the time period of the analysis. Some countries were less successful at the beginning of the pandemic, but then performed better in later phases. Econometric studies that systematically examine the effects of the measures
using up to date longitudinal data are still pending. There are indications of the effectiveness of interventions in the first phase of the pandemic (e.g., Brauner et al., 2021; Chu et al., 2020; Johanna et al., 2020; for Germany Dehning et al., 2020) but there are also controversial reports (Herby et al., 2022). Especially, the type of the lockdown or of other preventive methods is expected to play a role (Brauner et al., 2021). For mask wearing, natural quasi-experiments provide evidence for the reduction of infection rates by the use of masks in public. For example, 24 Kansas counties made mask use mandatory while in 81 counties the use of masks was voluntarily (Van Dyke et al., 2020). The German city of Jena was an early adopter of a mask wearing policy. A study by Mitze et al. (2020) reports that the daily growth rate of infections declined by 47% due to the obligatory use of face masks.

Contact restrictions and distance bans (of at least 1.5 m) were adopted in Germany by all states on 22 March 2020, after consultation with the federal government. The drastic measures, which curtail numerous fundamental rights, are supported by the majority of the population (e.g., Wagner et al., 2020). Have they been followed? There is ample evidence to support this during the first wave of the epidemic in spring 2020. For example, the anonymized data of cell phone movement profiles published and continuously updated by the company Google show new behavior patterns. Not only in Germany, in almost all of the 131 states for which Google reports data, spending time at work and in formerly popular public places declined, while spending time in private spaces grew. For recreational facilities, restaurants, shopping, for example, a 77% decline from the median of previous weeks is reported through 29 March 2020. It is interesting to note here that significant behavioral changes are already evident prior to the state resolutions on March 22. Thus, the population has to a considerable extent already changed its behavior on a voluntary basis before the official orders.

Keeping distance from others and avoiding contact was increasingly practiced. The negative externality of the risk of contagion was responded to with changes in behavior. One can speak of the emergence of a “latent norm” in the sense of Wrong (1994). Wrong (1994) characterizes the process as “expectations that arise concerning habits emerging and crystallizing in the course of repeated interactions” (see also Diekmann and Przepiorka, 2016). The development of “bottom up” risk-aware actors was finally joined “top down” by the decision of the federal and state governments, or rather the state governments, on the distance requirement, the mobility restriction, and later the mask requirement. The legal norms, which also carry the threat of sanctions, were set by institutions and declared binding. In addition to the distance norm, other behaviors emerged spontaneously. Shaking hands was frowned upon, new forms of greeting such as bumping elbows or bowing slightly according to Japanese ritual were tried out more or less playfully. An emergence of latent coordination norms can be observed. This can easily
lead to norm conflicts. The TV pictures caused quite a stir when Interior Minister Seehofer refused to shake Chancellor Merkel’s hand at a meeting in Berlin (on 2 March 2020). No one can predict with certainty whether new forms of greeting will emerge and possibly displace the centuries-old culture of the handshake in Germany and many other countries, which alternative rituals will prevail or coexist, or if handshaking will reemerge after the pandemic. At present, all that can be said is: At least in Germany shaking hands is more or less taboo in most interactions. Here, even the latent norm has developed into a norm of omission. The person who extends his hand in greeting himself may fear being mildly sanctioned by the other person.

Adherence to the distance norm is one of the most effective measures against infection during social contact, according to a meta-analysis by Chu et al. (2020). The coordination norm was highly adhered to at the height of the epidemic and thereafter, as online surveys reinforce. The Cosmo Study (2020) has surveyed approximately 1000 people aged 18–74 years weekly since 3 March 2020. While such online panels are usually not truly representative, they do provide valuable information on a longitudinal basis. After all, if the design is not changed, even less representative studies can at least reveal trends (for details of the method, see COSMO, 2020). Here, it can be seen that a very high proportion state that they follow the norm of the distance requirement according to their own assessment. The values here have been stable at over 90% since March 24 and only decrease minimally. On May 5 the value was still 89%. The measure was made mandatory by the states with the decision on March 22, but it can be strongly assumed that most people already adhered to distance rules before then. Prior to March 24, the distance rule was not included in the questionnaire, but it was asked about whether the respondent avoided crowds. According to their own statements, this was the case for 91.4% in the survey on March 17 (65% on March 10).

The values for compliance with the distance requirement are around 90% over a longer period of time. The situation is different for mask wearing. Here, it is mainly a matter of so-called everyday masks, be they surgical masks or homemade protective masks. Since the middle of March, there has been a recommendation from the German government to put on “mouth-nose protection” in public. The introduction of a duty with the threat of a fine in case of violation, as with the distance measures, was still controversial at the time. The mask requirement was not introduced by all states until 27 April 2020; only Saxony and some cities such as Jena had jumped ahead on this measure. The Cosmo study reports the proportions of respondents who said they “wear masks” (question until April 7, then “use frequently”). In the first wave of the panel (March 3), the figure is just 8% (Figure 2). This figure rises to 34% in the eighth wave (April 21) before the introduction of the nationwide mask requirement on April 27. After the “intervention,” the percentage rises to 60% (April 28) and 1 week later to 77% (May 5). The
mandatory mask policy applies to stores and public transport. Those who visited a supermarket before the introduction of the decree will be able to share the experience: Only a minority had put on a mask. Afterward, almost all customers did. Of course, this was helped by the fact that many stores demanded that customers wear masks as soon as they entered, and that compliance was checked by the staff. The image of people wearing face masks, which is familiar from Asian countries, now also appeared in German supermarkets. Unlike the distance requirement, however, putting on a mask before the official order was rather the exception, and only afterward the rule.

How is it that the new norms show such different patterns of compliance? The norms of social distancing and especially the distance requirement were very quickly complied with to an extraordinarily high degree; the norm of wearing masks in shops and public transportation, on the other hand, was not complied with until after the introduction of the mask requirement.

One reason is probably the different nature of the norms. For this, we need to take a closer look at the conflict of interests. Whoever complies with the distance standard first of all protects himself or herself from droplet infection, but at the same time also protects the other person with whom he or she comes into contact. Both have interests pointing in the same direction; the social norm of the distance requirement serves ego and alter—not unlike the right-hand-driving requirement in road traffic.

Equal interests does not mean that all persons have the same interest in the observance of the norm. It might also depend on the risk of suffering a serious illness. This is known to increase with age and pre-existing conditions.
conditions. During the peak of the first wave, major generational conflicts have not been reported. The younger part of the population was surprisingly solidary with the older generation. At most, isolated reports of “corona parties” appeared in the media. However, it can be assumed that with the duration of the epidemic, risk differentiation will occur, both regionally and in terms of age. Thus, it can be predicted that distance rules will be less adhered to in regions with low infection rates than in high-risk areas. Furthermore, adherence to the norm can be expected to correlate positively with age and other characteristics that increase the severity of disease.

If people follow the norm, the spread of the epidemic is also slowed. It thus also protects the collective good of health, or more precisely, reduces the risk of infection. Unlike in cooperation dilemmas, there is no incentive to free-ride in the case of coordination norms. Self-interest does not hinder but promotes collective welfare. What distance to keep is a coordination problem. The same applies to the form of greeting in a face-to-face encounter.

“Focal points” (Schelling, 1960), communication, and coordination norms (or conventions) contribute to attaining an equilibrium when confronted with a coordination problem. The rule “keep a distance of at least 1.5 m” became rapidly known in the population. Supermarkets, for example, marked the distances to be observed in the queue in front of the checkout with colored bars.8

Wearing masks is quite different. The message is that medical masks mainly protect other people nearby from droplet infection. The extent to which they also protect the wearer is controversial. In addition, many people do not find wearing a mask very comfortable, and the masks also have a price that has only decreased as demand has grown. The World Health Organization and the Robert Koch Institute (the German equivalent of the CDC, the Center for Disease Control) did not initially promote mask wearing to the public. Later, it was communicated that self-protection by medical masks was less than the protection effect of other people. According to a statement of the Robert Koch Institute, medical masks primarily protect other persons from the virus.9 There are also masks that protect both, the wearer and other persons (FFP2 or US N95 masks). But these masks were in short supply in spring 2020 and there were appeals to leave these masks to medical staff.

Explanations of action must, this is almost an axiom of sociology, take into account the subjective perspective, the “definition of the situation” of the actors (Esser, 1999; Merton, 1948). Objective incentives and risks can be perceived differently. This is all the more true when the protective effects of simple “everyday masks” were controversial, not only among lay people but also in the medical community, at least at the beginning of the epidemic. Thus, self-protection may have been greatly overestimated. However, a “self-protection illusion” that prioritizes the protection of the wearer is not supported by survey results. The Cosmo study, for example, shows that the
population expects masks to provide more protection for others than for themselves (COSMO, 2020).

In the case of the new coronavirus, mask wearing is particularly useful because the disease is highly contagious (more so than influenza) and, above all, as is now known, it is contagious even if the infected person does not experience any symptoms. These asymptomatic infections pose a particular risk to those around them because the carriers of the disease are unaware of the infection and have no reason to stay away from social life.

When wearing masks in situations where the distance requirement cannot be observed, such as in stores or on public transport, the risk of infection is reduced if a very large number of people, preferably all, wear a mask. Similar to a measles vaccination, a person is protected if all or as many others as possible behave cooperatively. Now, however, it “pays” to free-ride, because when a norm is violated, protection is conferred by cooperative fellow human beings. Self-interest and collective good fall apart, as in so many situations in politics, business and society.

As in the case of environmental protection and climate change, the obvious discrepancy between attitude and behavior is repeatedly addressed, precisely because the collective good problem is often not recognized. Before the introduction of mandatory masks, the use of masks when shopping is supported by more than 60%, and in public transport even by more than 80% (Wagner et al., 2020). In fact, however, far fewer customers and passengers have made use of masks, as also shown by the figures obtained by COSMO (2020). It is only because of the mask requirement that the cooperation rate has risen steeply; the recommendation, on the other hand, has proven to have little behavioral relevance.

Wearing masks in public in places where the distance requirement is not feasible contributes to the collective good of health. The social norm is a cooperation norm. In contrast to the coordination norm, a violation is in the self-interest, provided that the other people behave cooperatively. Instead of a right-hand-driving rule, it is a norm comparable to a parking ban that protects the collective good of scarce public space. Thus, even an appeal to voluntariness or an urgent recommendation would hardly help motorists to obey parking bans in inner cities if this could be done without sanctions.

It should be added that other reasons for not wearing masks before the introduction of the obligation may play a role. For example, the message from the authorities on mask wearing was initially rather negative. Side effects and risks were overemphasized. As in discussions about mandatory helmet use when driving a motorbike, the argument of “risk compensation” was used. Official recommendations stated that people would be lulled into a false sense of security by wearing a mask and would therefore behave more riskily. The obligation to use a mask and the distance standard would thus be in conflict. Risk compensation with motorcycle helmets, for example, has
been clearly refuted empirically (Thompson et al., 2001) but in the case of mask wearing, a majority in the population assumed that as a result of mask wearing, there is less compliance with the distance rule (COSMO, 2020). However, there is no systematic evidence on behavioral changes. It is therefore highly questionable whether the wearing of a simple medical mask actually led to the distance standard being violated more frequently. Inconvenience and lack of knowledge and habit could also have made mask wearing more difficult. If few wear masks, it may be more embarrassing to put on a mask oneself. The norm in Asian countries in epidemic situations was rather ridiculed in Europe. If many people wear a mask, it is easier to conform to the behavior. Hypotheses and field experiments from social psychology support the argument. Norm compliance theory (Cialdini et al., 1990) points to the influence of descriptive norms. The more people visibly comply with a norm, the more likely people are to comply. Laboratory and field experiments also show a high level of prosocial behavior in the population. This is certainly a good basis for assuming that there is generally a willingness to follow cooperative norms if other conditions are met. In particular, many people act “conditionally cooperatively,” that is, they are willing to follow a norm of cooperation if other people do so as well (Fischbacher et al., 2001). When norm violations are readily apparent, as in mask wearing, and the norm is accepted, social sanctions of disapproval also occur. However, norms of cooperation are fragile if they are not obligatory, not internalized, and no threats of sanctions exist. When norm compliance is initially relatively high, a downward spiral easily occurs; the norm erodes (Fehr and Gächter, 2002). Norms that have not yet been established, on the other hand, are unlikely to develop if initially only a few “outsiders” behave cooperatively. This is why the recommendation to wear masks has hardly had any effect; only the obligation to wear masks has given validity to the norm of cooperation (see also Betsch et al., 2020).

**Tracing apps as a collective good and contribution game**

The tracing app for anonymous, decentralized tracking of contacts with virus carriers was introduced in Germany on 16 June 2020. The use of the app, the diffusion of adoption, and other behavioral aspects are interesting examples of social cooperation and public good provision.

The app is based on Bluetooth technology and is designed to address privacy concerns. The goal is for a person who installs the app on his or her smartphone to be alerted if he or she has had contact with an infected person at a close distance (less than 1.5 or 2 m) over a certain period of 10–15 min.

Unlike the decentralized tracing app, tracking apps with centralized data storage are used in China, as well as in democratically constituted countries...
such as South Korea or Iceland. In some countries, non-cooperation comes with significant disadvantages. The app developed in China was not mandatory, but mobility between neighborhoods or by public transport was only possible with “green” signaling app (Ferretti et al., 2020). In contrast, privacy concerns had a high priority in designing the app in Germany and other European countries. There was distrust that state authorities might collect sensitive private data. Thus, the European project is based on voluntariness and anonymity. In this way, it is hoped to build trust, meet data protection standards, and achieve a sufficiently high level of cooperation. However, there are also objections that the strong emphasis on privacy protection made the app less effective to the detriment of the protection of citizens’ health.

The more people who use the app, the greater the likelihood of detecting chains of infection, in addition to the manual work of public health institutions. The extent of general use of the app is thus a collective good whose value increases with the number of users. However, the increase is not linear, as is the case in most collective good experiments.\(^\text{11}\) However, the willingness to cooperate then also depends on the course of the “production function” of the collective good, as Oliver et al. (1985) argue in the “Theory of Critical Mass.”

Simulation studies cite a threshold of 60\%, and another report cites 42\% (University of Oxford 2020a, 2020b). In the extreme case, it could be a step function: Below the threshold of x\%, the app is of little help; above the threshold, the epidemic is contained (Figure 3). This would then mean that a person’s cooperativeness would be useless if the threshold is not reached. Paradoxically, the contribution would also be useless if the threshold is exceeded. According to the simulation models, once the threshold is reached, the infection will subside; further users of the app would then make only a very small or no significant additional contribution.

“Contribution games” are familiar, although not under this name, in democratic voting with a quorum. With small groups, there is a high probability that one’s own vote will make a difference, so that a result is achieved at all. For large groups, such as a referendum with a quorum of 20\%, all votes below 20\% are wasted; above the 20\% threshold, in turn, a single vote will rarely make the difference. The production function is a step function.

However, the production function will not be that extreme. The Oxford study also makes the point that at least the epidemic could be inhibited if participation were below 60\%. The simulation assumes that no alternative measures are taken. As we know, this is not the case. Thus, we may also assume that the app can contribute to the reduction of contagion already far below the threshold. Presumably, the course of the production function will be more S-shaped. Obviously, the further “left” the inflection point, the greater the benefit of the app. Values of 60\% are also hardly ever achieved on
a voluntary basis. Apart from the numerous technical problems, there are also two hurdles to overcome with a decentralized app based on voluntariness. First, the app has to be activated on the smartphone. But in the second step, an infected user must also provide the diagnosis so that contacts can be alerted anonymously.

It will not be easy to motivate a high level of cooperation. In contrast to wearing a mask, keeping your distance, and avoiding crowds, the activation of an app is not visible. Social sanctions such as those for wearing a visible mask do not apply. Communication about the app in social networks can make the behavior of friends and acquaintances recognizable, but the app is not visible to the outside world as mask wearing is. A mandatory cooperation standard would have no political chance, would hardly be enforceable, and would provoke massive resistance. It would be possible to set positive incentives, but this would possibly feed mistrust and destroy intrinsic motivation. However, the app could be enriched with other functions, such as anonymized information on the incidence of infections in the vicinity and the region, or other important information, so that the interest of potential users could increase. At least there is a positive, individual incentive to use the app: This is because the user is alerted when the contact history indicates an infectious contact. Most people will appreciate this information because they can then reduce the risk of infection in their social environment. In surveys conducted in April 2020, 56% of respondents said they would use a COVID infection tracking app if it were offered (Wagner et al., 2020). However, experience has shown that it is a long way from the expression of an opinion to actual behavior in the case of collective goods.

Figure 3. Hypothetical functions of collective good production.
In practice, it has been shown that the percentage of the population downloading the “Corona-Warn-App” during the first year of the pandemic is far below what is reported in the surveys. This is also not surprising, because in addition to the attitude-behavior discrepancy, the app can only be installed on new smartphone versions. After all, 24.2 million people or about 30% of the German population have downloaded the app on their smartphone (as of 17 December 2020, Robert Koch Institute, 2020b). Presumably, this is also because many users are interested in being alerted in the event of an infectious contact. Collective good theory (Olson, 1965) informs us about the importance of “selective incentives”. To date, the app has been further expanded in this direction. It provides more information about infection events and has a number of other useful features, such as storing test and vaccination certificates. Statistics show 41.9 million downloads of the app by 2 February 2022 (Robert Koch Institute, 2022).

How many people could now be warned? Of course, there are no individual data about this due to the programmed data protection. However, the aggregate number of positive test results of app users is known. A rough estimate (based on data from autumn 2020) is that less than every second owner of a smart phone downloaded the app, every second infected person using the app actually transmitted the result and thus about 10% of all detected infections in the population was communicated via the app to warn other people potentially having been infected. This share may have increased further with the increasing number of subsequent downloads of the app. A decentralized tracing app with a high emphasis on privacy concerns is not a digital silver bullet to combat the epidemic. However, the app is an useful instrument but it can only complement conventional methods of tracing infection chains via public health authorities as well as other preventive measures.

However, even under the condition of strong privacy concerns there are possibilities to improve the app and to increase the rate of cooperation. An important issue is the “default” regulation: users with a positive test result have to make an opt-in decision. They have to decide whether to transmit the result or not. Behavioral research on the importance of default effects clearly shows that automatic transmission (with an opt-out choice) would have increased cooperation rates drastically (e.g., Ebeling and Lotz, 2015; Liebe et al., 2018). Here again it can be seen that engineering solutions would profit from research on social cooperation and collective goods.

Discussion

Social norms can refer to coordination or cooperation situations. This distinction is central, mainly because coordination norms are followed in self-interest, while cooperation norms are violated in self-interest. Therefore,
coordination norms are more easily enforceable than cooperation norms. The right-hand-driving requirement is self-enforcing, whereas a parking prohibition must be monitored and sanctioned if violated. The new norm of the distance requirement corresponds more to a coordination rule, the wearing of medical masks more to a cooperation norm. Only the obligation to wear masks has given validity to the new norm. It also follows from the central thesis of this article that recommendations and moral appeals are of little help with cooperation norms. Until the introduction of mandatory mask wearing at the end of April 2020, the federal government, the states and the Robert Koch Institute (the counterpart to the Centers of Disease Control and Prevention (CDC) in the US) contented themselves with recommendations; presumably also because there were initially shortage problems with the production and import of masks. Although Germany has come through the first wave of the epidemic relatively well compared to other European countries, it is very likely that many cases of infection could have been prevented if masks had been made mandatory earlier.

It is also striking how quickly and strongly the mask decree changed actual behavior. Often, the collective mentality of Asians versus the individualistic attitude of Europeans has been put forward to explain the difference in behavior when infections occur (e.g., Zheng, 2020). It is possible, however, that cultural differences are less of a barrier to the impact of interventions to contain the Coronavirus pandemic than has been assumed. This is because, as risks were perceived and situational conditions changed, the mask wearing regulation was very quickly accepted and followed.

Adherence to social norms depends, of course, on other conditions, as can be seen from an extensive literature (e.g., Bicchieri, 2006; Bicchieri, 2017; Cialdini et al., 1990; Hechter and Opp, 2001; Opp, 1983, 2020). Here, especially, with regard to the COVID crisis, one aspect has been elaborated: the behavioral influence of the type of social norms. Anyone researching the effect of social norms is well advised to first examine the structure of action. Game-theoretic models can be helpful in this task to elucidate the precise structure of the interaction. A key question then is whether the action structure is of the cooperation dilemma type or a coordination problem. Further hypotheses can be derived by considering the subjective perception of the individual elements of the interaction (the definition of the situation). This includes two components: The perception of the material and intrinsic incentives present in the structure of action and the heterogeneity of risk perception (the “beliefs”).

Those who do not perceive any risk for themselves will at best follow the new COVID norms out of altruistic motives, the protection of family and friends, or because of threats of sanctions. The lower the perceived risk of contagion, the lower the degree of adherence to social norms, including especially coordination norms. The younger and the better the physical
condition with respect to the severity of a possible infection, the lower the propensity to follow distance norms. In addition, there is the context variable of the risk of infection in an area. Both are likely to influence behavior, especially after the initial wave of infection has subsided. Finally, habituation to risk is likely to play a role, with risk becoming the “new normal.” Related to this is an erosion of norms over time. It is to be expected that with decreasing infection numbers and the regionally varying policy of opening up the economy and society, norm-oriented behavior will dwindle and norms will erode.\textsuperscript{15} It is very likely that this process of norm erosion has contributed to the increase of infections in autumn and winter 2020 (“the second wave”).

The individual hypothesis about risk perception, the context hypothesis about local infection risks, and the “erosion hypothesis” of risk perception can be tested on available empirical data. The same is true for the central hypothesis of the distinction between norms of cooperation and norms of coordination. Although no results of systematic tests are presented in this article, empirical evidence from the longitudinal data of the Cosmo project supports the core hypothesis.

We are now in the situation that effective vaccines have been developed and approved. This development poses new problems of collective action. Although a majority of the population is highly interested to become vaccinated a minority might refuse the protection. When this minority is too large free riders endanger the attempt to bring the pandemic to an end. Social and epidemiological research will certainly observe how the dynamics of vaccination will evolve in the coming months. Research on social cooperation can inspire better policies on how to mitigate an epidemic and how to attain the goal of “vaccination as a social contract” (Korn et al., 2020).\textsuperscript{16}

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Notes

1. A variety of definitions of social norms have been proposed in the literature (overview in Opp, 1983; Hechter and Opp, 2001). A commonly used definition refers to two components: first, a norm is a regularity of behavior; second, deviation threatens a sanction. Thus, social norms can be defined as behavioral rules backed by sanctions. Depending on the theoretical perspective, other criteria are added that relate to attitudes and expectations of ego and alter (Bicchieri, 2017). The central messages of the article do not change when other definitions of norms are used.

2. A Nash equilibrium is a combination of strategies such that none of the actors has an incentive to unilaterally change its strategy. If the other actors stick to the “left” strategy choice, there is only a loss here if ego were to change his “left” strategy.

3. “Social dilemmas (...) are situations with strategically interdependent actors such that individually rational behavior leads to an outcome that is less desirable for each actor than had they cooperated” (Raub et al., 2015). Note that this definition comprises cooperation and coordination dilemmas. For an overview and a discussion, see Raub et al., (2015).

4. The Mormons tried it in Missouri in 1831 under the leadership of Joseph Smith. The tax payment was voluntary. Their first state incorporation in Jackson County failed after only 3 years (Bullock and Baden, 1977).

5. Mackie (1996) has also applied the coordination thesis to the practice of female genital mutilation. From an empirical perspective, there are compelling counterarguments (Efferson et al., 2015). However, the case is different for foot binding. Here, his explanation has not been refuted. It should be added that the controversy is not only of academic interest, but also has significant consequences for development policy.

6. For the sake of completeness, it is worth mentioning another category of norms that Ullmann-Margalit did not address. The “signal norms” mentioned at the beginning also play an important role. See Posner (2000), Przepiorka and Diekmann (2021).

7. The data are based on Android smartphones that were appropriately set by users so that localization was possible. Accordingly, the sample is not representative, but allows the diagnosis of trends. See Google (2020).

8. Note, however, that not all people gain from coordination. People who do not perceive a risk may avoid the cost of coordination. Even when coordination norms are self-enforcing for most people they are not self-enforcing for all people. Therefore, even with coordination problems sanctions or rewards may be necessary to increase compliance with the norm.
9. “While an MNS (‘mouth-nose’ protection, AD) is primarily intended to protect others from fine droplets and particles in the exhaled air of the person wearing an MNS (third-party protection), the goal of FFP2/FFP3 masks is to personally protect the wearer from infections, including those transmitted by microscopic droplets (aerosols)” (translated from Robert Koch Institute, 2020a). MNS are the so-called everyday masks or medical masks that are the primary concern of the mask requirement. FFP2 masks protect both other persons and the mask wearing person. They are the equivalent of US N95 masks. These masks were rare in the first wave of the pandemic in spring 2020 but they are more common in the second wave in autumn/winter 2020/2021. There was government action to distribute FFP2 masks to citizens 65 an older in December 2020. Also, FFP2 masks are available in shops and pharmacies.

10. Even if the unintended side effect of riskier behavior occurs, this does not yet mean that complete risk compensation can be expected, as claimed by the theory of risk homoestasis. Reductions in passive risk through protective measures may indeed increase active risk through behavioral adaptation. However, it does not follow that the “net effect” of the protective measure is zero. Mandatory seat belts for motorists and mandatory helmets for motorcyclists have reduced the overall risk of accidents.

11. The first collective good experiments were conducted by the sociologists Marwell and Ames (1979); their game model was later taken up in behavioral economics. Today, we can see that the (linear) collective good experiment has mutated into a kind of “Drosophila” of behavioral economics (on an early survey Ledyard, 1995). Unlike the linear collective good game, a contribution game requires that a threshold level of cooperating actors be reached in order to generate the collective good. If the threshold is not reached, the contributions of all players are wasted. If the threshold has been reached, further contributions are useless. Neither free-riding nor cooperation are dominant strategies. Thus, a person’s decision to cooperate is characterized by strong uncertainty. First experiments with this strategic situation were reported by Van de Kragt et al. (1983).

12. This number is 235544 in the time span September 1 to 16 December 2020. Of these 128638 or 55 % were communicated via the warning app. The seven-day estimate of daily reported positive test results is 2633 (Robert Koch Institute, 2020b). With about 20–30 thousand new infections per day the app alarms possible contacts of about 10% of all infections. About a year later (2 February 2022), the cumulative number of all warnings since the introduction of the app has risen to as many as 23.6 million (Robert Koch Institute, 2022). The proportion of people who tested positive and passed on this information was estimated at 61% (Robert Koch Institute, 2021).

13. In most cases, positive test results are automatically sent to the app. In the next step, the user has to decide on communicating the test result (anonymously) to contact persons identified by the software.
14. Kittel et al. (2021) analyze the interplay of trust in institutions, perceived social norms, the perception of risks, and preventive behavior. Based on Austrian panel data they were able to demonstrate that risk perception clearly increases preventive behavior while social norms are most relevant when perceived risks are low.

15. The costs of spatial distancing also vary. It has often been emphasized that a single mother in a two-bedroom apartment has a much harder time maintaining contact restrictions than do residents of single-family homes. As we know, the virus is “not democratic” to paraphrase Beck (1992). The risk of infection and the severity of the consequences of disease increase dramatically with age and with pre-existing conditions. These, in turn, depend on social position. The difference in “generational interest” in rigid measures versus relaxation is illustrated by lawsuits before the Federal Supreme Court. An older plaintiff filed a motion to maintain the lockdown, while a younger plaintiff pleaded for relaxation. Both lawsuits were dismissed by the Federal Court (“Bundesgerichtshof”, BGH). Nevertheless, even during the weeks of the strict lockdown, there was no noticeable generation conflict. Very many young people have seen the responsibility to protect older people. As the number of infections falls, however, the different perceptions of risk could become more noticeable.

16. Of course, when vaccination started the main problems are the scarcity of the serum, the logistics to distribute it, and the problem to distribute enough vaccines to poor and middle income countries. Problems of free-riding arise when vaccination efforts are below the threshold of so-called herd immunity. In this case, the collective action problem is similar to a contribution game.

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