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Keep that mask on: will Germans become more like East Asians?

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We study planned changes in protective routines after the COVID-19 pandemic: in a survey in Germany among >650 respondents, we find that the majority plans to use face masks in certain situations even after the end of the pandemic. We observe that this willingness is strongly related to the perception that there is something to be learned from East Asians' handling of pandemics, even when controlling for perceived protection by wearing masks. Given strong empirical evidence that face masks help prevent the spread of respiratory diseases and given the considerable estimated health and economic costs of such diseases even pre-Corona, this would be a very positive side effect of the current crisis.

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Introduction

In this article, we provide survey evidence that the current increased usage of face masks may continue in Germany even after the end of the Corona crisis.

Knowledge about COVID-19 and its transmission has accumulated over time. In early January 2020, Chinese authorities still denied that the novel coronavirus could be transmitted from person to person. The possibility of virus transmission via aerosols was also downplayed at first. Whereas in the early months of 2020, worried consumers around the world bought up protective hygiene products, such as disinfectants, latex gloves and face masks, resulting in temporary shortages even in the medical sector, the World Health Organization (WHO) insisted even at the end of March that the usage of face masks was not recommended except in medical settings.[1]

First experimental evidence that even simple cloth covers were useful in preventing airborne coronavirus infection came from hamster experiments (Chan et al., 2020). This article was published in May 2020. At approximately the same time, several non-experimental studies came out about the effectiveness of face masks in reducing the human-to-human transmission, for example, Wang et al. (2020) who conducted a cohort study of families with at least one infected family member in Beijing, Zhang et al. (2020) who explained differences in epidemic trends by different intervention practices using infection data from Wuhan, China, Italy, and New York City, and Mitze et al. (2020) who used regional variation in compulsory face mask use in Germany to establish the role of face masks in reducing infection numbers. The meta-analysis by Chu et al. (2020) shows that the effectiveness of face masks in preventing the spread of COVID-19 is by now a well-established fact.

The Robert Koch Institute, as responsible health authority in Germany, had echoed the WHO's view in late winter and early spring that masks were unnecessary or even potentially harmful. However, as the acute shortage of masks eased in April, the public announcements concerning the usefulness of masks changed in tone and content, and by the end of April, Germany had introduced a nation-wide face mask requirement for supermarkets and other closed public spaces. Until then, the wearing of face masks had not been widespread in the population, whereas in East Asia, the usage of face masks to prevent the transmission of respiratory diseases was standard even before the current COVID-19 pandemic. In a survey conducted at Trier University (Germany) in April 2020 shortly before the introduction of the mask requirement, Rieger (2020) found that more than half the respondents considered wearing face masks in public weird, and particularly outside buildings, most people would not have voluntarily worn a mask. Yet most respondents also stated that they would abide by a legal obligation to wear a mask, and indeed, the general acceptance of the face mask requirement in Germany has remained high throughout 2020. In fact, Schunk and Wagner (2020) consider mask-wearing a new social norm in Germany and provide survey-based evidence that a high willingness of social multipliers, namely school teachers, exists to sanction violations against the mask-wearing requirement. The willingness to sanction norm violations is driven by personal characteristics (conscientiousness, neuroticism) rather than by economic incentives (Schunk and Wagner, 2020).

It is interesting to note that many East Asians did not wait for conclusive research results on the protectiveness of masks against COVID-19, but—relying on experience with other virus diseases with similar transmission channels—already used masks from the very start of the pandemic, even when living in countries where the local population did not wear masks yet (Sit et al., 2020). Will Germans learn from the East Asian experience? On the one hand, East Asia and in particular China seem to have coped extremely well with the current pandemic compared to other countries. However, on the other hand, the COVID-19 virus originated in China and China thus met a lot of criticism, especially at the beginning of the pandemic. As a result, xenophobic behavior directed against people of East Asian descent increased in many countries around the world, also in Germany.[2] Moreover, part of the Chinese success in uprooting the virus was accomplished via very harsh and early restrictions on personal liberties, such as freedom of movement. For weeks in early 2020, Western governments stressed that such restrictions were no option in democratic countries, only to later on resort to harsh restrictions themselves (see the Oxford Government Response Tracker (OxCGRT) database (Hale et al., 2020) on governmental restrictions to curb the pandemic by country and time described in Hale et al. (2020)). Interestingly, opinion polls in Germany show that a majority of the population continues to favor restrictions to personal freedom if they help curb infection numbers.[3]

Given that masks are also a useful tool to reduce infections with other diseases like common cold or influenza, one may wonder if Germans might continue to use masks even after the end of the current pandemic and the abolition of the legal mask-wearing enforcement: after all, planned permanent behavioral changes through COVID-19 have been already documented, e.g., for greeting behavior (Matschke and Rieger, 2021).

In this article, we investigate this question using data from a large-scale online survey. Its methodology is explained in section "Methodology", and its results are presented in section "Results". Finally, section "Conclusion" concludes.

Methodology

We use a follow-up wave of the aforementioned survey (Matschke and Rieger, 2021; Rieger, 2020) of Trier University conducted in December 2020, which was also advertised at several other German universities, to investigate attitudes towards face masks. In the survey wave, 656 respondents were asked the following questions about their planned behavior after the end of the COVID-19 pandemic:

1. Would you wear a face mask in a fully occupied bus during flu season?
2. Would you wear a face mask at a crowded indoor event, for example in a fully occupied lecture or concert hall, during flu season?
3. Would you wear a face mask in a fully occupied bus if you experience cold symptoms?
4. Would you wear a face mask at a crowded indoor event, for example in a fully occupied lecture or concert hall, if you experience cold symptoms?
5. Would you wear a face mask when visiting an older person with severe health problems if you experience cold symptoms?

Possible answers were: 1. totally disagree, 2. rather disagree, 3. rather agree, 4. fully agree.

The survey wave was part of a larger survey with in total >3000 participants that started already in March 2020 and has been described in more detail in Rieger and He-Ulbricht (2020). In previous waves of this survey, we also included some additional items that we will use in the subsequent analysis and will therefore describe briefly. In particular, we asked about the perceived strangeness of wearing a mask and about whether we should learn from East Asia regarding handling an epidemic (both items had the same answer options as above):

1. It is strange to see someone wearing a mask in public.
2. In general, we can learn a lot from East Asia when it comes to dealing with epidemics.

Moreover, we elicited information on how people perceive the protection given by masks:

1. In your opinion, how well does wearing a face mask protect the wearer from infection by the new coronavirus?
2. In your opinion, how well does wearing a face mask protect others from infection by the new coronavirus?

In both cases, possible answers were: 1. not at all, 2. little, 3. medium, 4. well, 5. very well.

Finally, we elicited the frequency of actual mask-wearing behavior during the pandemic with an index (later referred to as "mask wearing") computed from a couple of questions on this topic—see Rieger (2020) for details.

As a caveat when interpreting our results, one should note that Trier University focuses on the humanities and social sciences. This is also reflected in the distribution of survey participants: the respondents were mainly students and the majority was female, therefore the sample is not per se representative of the German populace. Moreover, as in any survey, it is possible that the responses about intended behavior will not match the actual behavior exhibited in the future. Yet, we believe that the survey results nevertheless offer an interesting example for the evolution of social norms in connection with the COVID-19 epidemic and the underlying reasons behind the changes.

Results

Masks after COVID-19. In March and April 2020, survey results reported in Rieger (2020) showed that 60% of respondents thought that wearing face masks in public appeared at least somewhat strange, and an even higher percentage was afraid of being viewed as strange when wearing a mask. In the same survey, most respondents already reported a willingness to voluntarily wear masks inside smaller closed spaces such as buses, and the reported intention to abide by a legal obligation to wear masks was even higher.

In the December 2020 survey wave, the respondents were for the first time asked about their planned mask-wearing behavior after the end of the Corona crisis.

The statistical distribution of responses to the key questions of the December survey wave is reported in Table 1. The results show that the use of masks after COVID-19 in some situations of daily life is likely to continue:

More than half the respondents (52.7%) plan to wear a mask during flu season in a fully occupied bus, whereas in a bigger closed space, only about a third would probably wear a mask.

The answers change considerably, however, in case the respondent himself exhibits cold symptoms. In this case, two thirds of the respondents would probably wear a mask in the bus and almost 60% would do this in a crowded larger indoor space such as a lecture hall. This shows that the science-supported (Chan et al., 2020) public health information that mask wearing is more effective in protecting others than in protecting oneself has borne some fruit[4] and that the respondents' willingness to wear masks is based more on altruism than on self-protection.

The strongest results are obtained when the respondents are confronted with the question of whether they, when experiencing cold symptoms, would wear a mask when visiting an old and frail person. In all, 58.8% of the respondents answer this question with an unconditional yes, and only 13.8 % would (rather) not wear a mask in this setting. This shows how important it is to put a concrete face to risk groups in order to encourage people to behave responsibly, since of course one could also infect an old and frail person while riding on a bus or attending a crowded indoor event.

Are the intentions about future behavior still volatile thoughts or already firm plans? To test this, in another survey wave in January 2021, we asked 134 survey participants the same questions again. The mean of the replies was very similar and not statistically different from the December 2020 wave. Only for the last question about visiting an old and frail person while exhibiting cold symptoms, the willingness to wear a mask was statistically different from the December result, even showing an increase in the likelihood to wear a mask (mean value of 3.61 in January compared to 3.38 in December).

We would like to stress again that all of these responses are in stark contrast to the pre-COVID-19 behavior in Germany: until then, masks were nearly exclusively used by physicians and medical staff in specific situations (surgery, at the dental clinic etc.). Other persons used masks only if they suffered from a severe reduction of their immune system (e.g., during a chemotherapy). That more than half of the respondents plan to wear a mask on a bus during flu season even after the pandemic is over can therefore be seen as some kind of cultural upheaval.

We now investigate the reasons behind the willingness to wear masks after the end of the pandemic. In a first step, we regress the willingness to wear masks, which we calculate as an aggregation of the demographic variables, namely age, gender, whether or not the person is already holding a bachelor degree, and student status as well as variables on perceived protection from mask usage for oneself and for others. For the ordinary least squares (OLS) regressions, we split the sample into male and female participants and also age groups (younger than 25 years vs. 25 and older). The variables are standardized so that we can directly compare the coefficient size. The dependent variable "willingness to wear masks after COVID-19" summarizes the five items about different situations into one factor with a Cronbach's Alpha of 0.91, showing the high internal consistency of the questions.

In columns (1) and (2) of Table 2, we have split the sample by gender, in columns (3) and (4), the sample split is by age group. In neither of the regressions, the demographic independent variables turn out to be statistically significant, and the estimated coefficients are very small. The motive to protect others from infections comes out as a very strong determinant of continued mask usage after the end of the pandemic: the estimated coefficient is large and highly statistically significant. The motive to protect others is slightly stronger for older individuals and males, but the differences are negligible. Interesting differences are obtained for the effect of the perceived self-protection from

Questions **Would you wear a mask ...**	Mean	SD	Totally disagree (=1)	Rather disagree (=2)	Rather agree (=3)	Totally agree (=4)
in a full bus during flu season	2.54	0.95	15.5%	31.7%	35.8%	16.9%
at a crowded indoor event during flu season	2.15	0.90	25.8%	41.6%	24.2%	8.4%
in a full bus while having cold symptoms	2.89	0.98	11.3%	20.9%	35.7%	32.2%
at a crowded indoor event while having cold symptoms	2.73	1.00	13.9%	26.1%	33.7%	26.4%
visiting an old and frail person while having cold symptoms N = 656	3.38	0.89	7.2%	6.6%	27.4%	58.8%

Table 1 Planned mask wearing after COVID-19, descriptive results.

Table 2 Willingness to wear masks after COVID-19, controlling for perceived protection from mask wearing.

	Willingness to wear masks after COVID-19			
	Female (1)	Male (2)	<25 years (3)	≥25 years (4)
Masks self-protection	0.133[*]	0.119	0.068	0.203[***]
	(2.464)	(1.912)	(1.278)	(3.204)
Masks protection others	0.258[***]	0.262[***]	0.243[***]	0.246[***]
	(4.779)	(4.18)	(4.531)	(3.92)
Age	0.022	0.105		
	(0.338)	(1.548)		
Female			0.043	0.026
			(0.843)	(0.472)
Bachelor degree	−0.048	−0.034	−0.086	0.036
	(−0.881)	(−0.543)	(−1.648)	(0.627)
Student	−0.088	−0.009	0.01	−0.109
	(−1.359)	(−0.134)	(0.2)	(−1.896)
N	348	293	366	275
Adj R^2	10.2%	9.9%	7.2%	15.3%

[*]Significant at the 5% level.
[**]Significant at the 1% level.
[***]Significant at the 0.1% level.
The model was estimated via ordinary least squares (OLS). The variables are standardized so that the coefficients directly inform about the size of the effects. The numbers in parentheses under the coefficient estimates are t-values.

mask usage. The estimated effect is considerably higher and statistically significant for females (an insignificant effect of 0.119 for males and a statistically (at the 5% level) significant 0.133 for females) and for older individuals (a small, insignificant 0.068 for persons under the age of 25 vs. a large and statistically significant (at the 0.1% level) 0.203 for older individuals). This is not surprising since females and older individuals are commonly considered to be more risk-averse. Moreover, older individuals are at a higher risk of suffering from complications in connection with infectious diseases.[5]

Learning from East Asia? While wearing masks in situations as described in our survey has not been observed in Germany before COVID-19, such behavior is quite common in several East Asian countries, e.g., in Japan and Taiwan. In Germany and other Western countries, this was sometimes noticed with interest and a bit of amusement, see e.g., Hahnefeld (2017) or Time (2015).

Given this difference, but also traditional differences in greeting behavior and policy responses to the outbreak of COVID-19 as well as the previous outbreak of SARS and other epidemics, it seems plausible to assess the expertise of East Asian countries in handling such situations as being higher than that of Germany (or most other Western countries). We wanted to know whether this line of thought is also shared by our respondents, and – most interestingly for the current study—whether it correlates with planned mask-wearing behavior after COVID-19.

Not unexpectedly, the view that we can learn from East Asia in these matters is strongly time dependent (Fig. 1): whereas in spring 2020, the average agreement was around 2.2 (on a scale from 1 to 4), in autumn it equaled about 2.7. At the same time, the impression that wearing a mask would be weird faded from around 1.95 in March to about 1.47 in September (Fig. 1). For both variables, the change over time is statistically significant.

The idea that one could learn from East Asia is significantly correlated not only with the positive attitude towards wearing masks, but also with judgements about their ability to protect (the wearer as well as others), the frequency of use, and finally also the
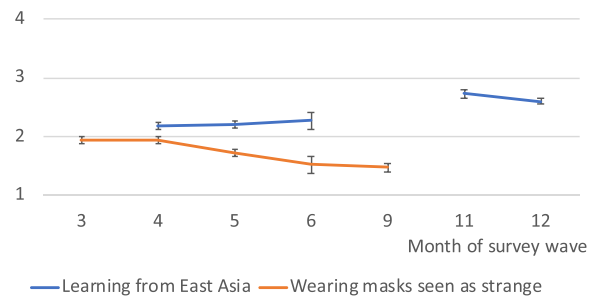

Fig. 1 Agreement to the statements that wearing a mask is strange, and that we can learn a lot from East Asia about how to handle epidemics. Average responses, where 1 = totally disagree, 4 = fully agree. Graph based on responses in survey waves from March to December 2020.

Table 3 Learning from East Asia correlates significantly with various attitudes towards masks, during and after the pandemic (Pearson correlations).

	Learning from East Asia	N
Willingness to wear masks after COVID-19	0.201[**]	656
Current wearing of masks	0.231[***]	1162
Wearing masks seen as strange	−0.101[*]	500
Masks self-protection	0.135[***]	1355
Masks protection others	0.192[***]	1355

[*]Significant at the 5% level.
[**]Significant at the 1% level.
[***]Significant at the 0.1% level.
All variables are standardized. The reported coefficients are the Pearson correlation coefficients. The number of observations may vary because not all variables were included in all survey waves.

planned mask-wearing behavior after COVID-19, as Table 3 shows.

The number of observations varies between rows because our survey was conducted in several waves. Whereas the question about learning from East Asia was included in all the waves on which Table 3 is based (1355 observations in total), this is not the case for all the variables appearing in the different rows. This also explains why we cannot use all variables in Table 3 as regressors in a regression analysis on the determinants of the willingness to wear masks in the post-pandemic future.

To better assess the effect of learning from East Asia, we now conduct regression analyses with the planned mask-wearing behavior after the pandemic as dependent variable and learning from East Asia as independent variable (together with additional controls), see Table 4. In all models where it appears (columns 2 to 4), the variable "learning from East Asia" proves highly significant ($p < 0.001$). The coefficient itself is clearly higher when considering the results that use data from the December 2020 and January 2021 wave (643 observations out of which 85% were students, 45.7% were males, 41.5% held a bachelor's degree and the average age was 25.9) in conjunction with available information about demographics (column 4). Moreover, a comparison between columns 1 and 4 shows that the inclusion of learning from East Asia increases the adjusted R^2 considerably.

The coefficients on the categorical explanatory variables "learning from East Asia", "masks self-protection", and "masks protection others" can be easily compared because the coefficients have been standardized. We see that the effect of protecting others is the strongest, followed by the effect of learning from East Asia. However, we expect the motive of protecting others to be subject to

Table 4 Learning from East Asia is a significant factor in the willingness to wear a mask after COVID-19, even when controlling for various other factors.

	Willingness to wear masks after COVID-19			
	(1)	(2)	(3)	(4)
Learning from East Asia		0.172***	0.144***	0.150***
		(4.964)	(4.048)	(3.985)
Masks self-protection	0.124**		0.133***	0.128***
	(3.056)		(3.356)	(3.183)
Masks protection others	0.259***		0.218***	0.230***
	(6.372)		(5.416)	(5.633)
Age	0.069			0.063
	(1.475)			(1.359)
Female	0.038			0.039
	(1.016)			(1.054)
Student	−0.046			−0.043
	(−0.997)			(−1.069)
Bachelor degree	−0.044			−0.043
	(−1.071)			(−0.926)
N	643	808	656	643
Adj. R^2	10.5%	2.8%	12.1%	13.6%

*Significant at the 5% level.
**Significant at the 1% level.
***Significant at the 0.1% level.
The model was estimated via ordinary least squares (OLS). The variables are standardized so that the coefficients directly inform about the size of the effects. The numbers in parentheses under the coefficient estimates are t-values.

Table 5 Determinants of perceived protection by face masks.

	Perceived protection by masks	
	for oneself	for others
Learning from East Asia	0.135***	0.190***
	(4.935)	(7.056)
Age	−0.029	−0.082*
	(−0.834)	(−2.416)
Female	−0.001	−0.032
	(−0.039)	(−1.176)
Bachelor degree	0.035	−0.057
	(1.197)	(−1.947)
Student	0.032	0
	(0.914)	(0.006)
N	1322	1322
Adj. R^2	1.8%	4.7%

*Significant at the 5% level.
**Significant at the 1% level.
***Significant at the 0.1% level.
The model was estimated via ordinary least squares (OLS). The variables are standardized so that the coefficients directly inform about the size of the effects. The numbers in parentheses under the coefficient estimates are t-values.

a positive "social desirability bias", which is present even in web-based surveys because a socially desirable answer is a cheap way of boosting the respondent's positive self-image (Brenner and DeLamater, 2016). We do not expect a similar positive bias for the learning from East Asia and self-protection effect.

To provide additional empirical support for the result that learning from East Asia adds to the protection motive behind plans to continue mask wearing after the end of the pandemic, we also regress the perceived protection variables (self-protection and protection of others due to face mask usage) on the demographic variables and the learning from East Asia variable in Table 5. Apart from a 5% significant negative effect of age when the dependent variable is the perceived protection for others, only the learning from East Asia variable is positively and significantly correlated with both perceived protection variables, but the correlation is not so strong as to make us worry about a multicollinearity issue.

In summary, we can conclude that people who agree that learning from East Asia regarding the handling of pandemics is a good idea also plan to keep using masks in certain future situations of everyday life—we might say they are willing to become a bit "more East Asian".

Conclusion

The reported attitudes towards mask wearing after the end of the COVID-19 crisis actually bode well both for public health and for the economy because continued mask wearing can lower both the health and the economic cost from other, commonly considered minor, respiratory diseases.

Every year, the flu causes thousands of deaths in Germany (e.g., the particularly deadly flu season of 2017/18 was conservatively estimated to have cost about 25,100 lives[6]) and even a common cold, for example caused by one of the already established Corona cold viruses, can be deadly for old and frail individuals (Roussel et al., 2020). In addition, the direct health care resource use and the

indirect economic productivity costs connected with the common cold are also substantial and eclipse the costs of many other, more serious medical conditions because common cold infections occur so frequently (Bramley et al., 2002; Fendrick et al., 2003).[7] Concerning the indirect costs of the common cold, Fendrick et al. (2003) estimated a cost of 22.5 billion US-$ due to caregiver and employee absenteeism in the United States per year, compared to 17 billion US-$ of direct medical costs. Bramley et al. (2002) arrived at a cost estimate of 25 billion US-$ of indirect costs, of which 16.6 billion US-$ were attributed to on-the-job productivity loss due to sick employees who nevertheless reported to work, an indirect economic cost that Fendrick et al. (2003) did not consider.

While the numbers thus clearly differ, they both indicate substantial economic losses that respiratory diseases which are harmless at first glance cause, in addition to the direct medical costs. Despite these costs, the wearing of face masks in non-medical settings has been uncommon in Germany and more generally the Western world, quite in contrast to some East Asian countries where face masks were common even pre-Corona to protect oneself and others.

The observed prospective increase in the usage of face masks after the end of the current pandemic may thus not only make Germans "more Asian", but also entail substantial economic and health benefits and thus represents good news even if the next pandemic hopefully does not come any time soon.

Notes

1 For example, the WHO tweeted on March 26, 2020 (https://twitter.com/WHOWPRO/status/1243171683067777024): "If you do not have any respiratory symptoms, such as fever, cough, or runny nose, you do not need to wear a medical mask. When used alone, masks can give you a false feeling of protection and can even be a source of infection when not used correctly."

2 See newsreports such as, e.g., https://www.straitstimes.com/world/europe/german-and-other-european-media-fan-coronavirus-fears-and-sinophobia

3 As an example, before the start of the second COVID-19 wave, at the end of August, 2020, >75% of respondents in a Germany-wide opinion poll were in favor of harsher Corona restrictions: https://www.zdf.de/nachrichten/politik/politbarometer-coronavirus-kontrollen-100.html?slide=1598534026580

4 The view that masks help protect others rather than oneself was already expressed by a majority of survey respondents in spring 2020 (Rieger, 2020).

5 For COVID-19, this is by now common knowledge, but it also holds for most other infectious diseases, i.e., influenza. For a comparison of COVID-19 and influenza mortality rates in France by age group, see Piroth et al. (2021).

6 https://de.statista.com/statistik/daten/studie/405363/umfrage/influenza-assoziierte-uebersterblichkeit-exzess-mortalitaet-in-deutschland/

7 According to the CDC (https://www.cdc.gov/features/rhinoviruses/index.html), an adult has on average 2–3 colds per year.

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Competing interests

The authors declare no competing interests.

Ethical approval

The ethics committee of Trier University exempts the study from ethics approval.

Informed consent

Informed consent was obtained from all participants.

Additional information

Supplementary information The online version contains supplementary material available at https://doi.org/10.1057/s41599-022-01057-z.

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