COVID-19 infection induces higher trust in strangers

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How does the COVID-19 pandemic affect interpersonal trust? Most evidence shows that natural disasters reinforce trust and cooperation, but the COVID-19 virus differs from other calamities, since it spreads through contact with people, potentially increasing suspicion and distrust, as, according to contemporaneous writers' accounts, seems to have been the case with the Black Death, the London plague, and the Spanish influenza. We investigate the link between interpersonal trust and individuals exposed to COVID-19, either vicariously through their community or networks or directly by becoming infected. We rely on an original panel survey, including a survey experiment, with a representative sample of adults in Italy, one of the countries hardest struck by the pandemic. Our experimental findings reveal that priming people about the risk that the pandemic poses to their health leads to a substantial increase in their trust in strangers. Our panel data analysis of within-individual effects shows that those who become infected trust strangers more than those who are not infected. Our findings could be explained by people observing higher than expected altruistic behavior or becoming more dependent on other people's support, consistent with the "emancipation theory of trust." When people recover from COVID-19, however, they drop to trusting strangers as much as those who were not directly exposed to the virus, an indication that the positive effects on trust during the pandemic have an emotional source. Nonetheless, the evidence suggests that, in the aggregate, there has been a small but significant increase in trust among the general population relative to prepandemic levels.

COVID-19 | trust | natural threats

Thus far, most people on the planet have not been infected by the COVID-19 virus, and an unknown share of those who have been do not necessarily know whether they were, for they experienced few or no symptoms. Most people, however, have been experiencing the pandemic as a threat—to their health and livelihood, as well as to those of their families and friends. This global phenomenon offers an unprecedented opportunity to study how a natural threat of this nature and scale affects interpersonal relations.

Most of the evidence shows that experiencing natural disasters—tsunami, earthquakes, typhoons, volcanic eruptions—reinforces trust and cooperation (1–8). Yet, the COVID-19 pandemic differs from other calamities. While these are geographically circumscribed, the virus has gone global in just a few months. Furthermore, unlike most other cataclysms, the pandemic is not a one-off event but creeps on, and, at the time of writing, we do not know for how long mankind will have to put up with it and with what level of lethality. Above all, crucially for our concern, it spreads by contact with other people, and how dangerous each person ends up being depends on how considerate and mindful of other people's health she is, and how closely she respects certain rules—social distancing, hand washing, wearing masks, and isolating when ill or after being in contact with infected people.

How should we then expect people to respond to the fact that, in a viral sense, *l'enfer c'est les autres*, as Jean Paul Sartre remarked? Does the response to the pandemic differ from that elicited by other natural disasters, and lead to a lowering of interpersonal trust? One can think of arguments going in both directions. On the one hand, infection travels in a way that turns every person into a threat. On the other hand, the pandemic could make us feel "in the same boat" with others, intensifying our sense of solidarity and shared humanity. We could feel more in need of other people's support and consideration and be put in a position to test their generosity.

If we search in the literature for enlightenment, we find many cases in which, following emergencies and disasters, people behave altruistically (9, 10) and support prosocial norms (11). According to parasite stress theory (12) and terror management theory (13, 14), exposure to life-threatening events should strengthen a sense of belonging to the in-group and reinforce cooperation. Consistent with these theories, recent studies find that exposure to the "first wave" of the COVID-19 crisis is associated with

Significance

The COVID-19 pandemic went global in a few months, caused millions of deaths, and is destroying the livelihood of countless people. This paper tries to discover whether the pandemic is destroying our social fabric too. Most research has found that natural catastrophes result in an increase of trust and cooperativeness. But what about a catastrophe whose diffusion occurs by contact with other people? Contemporaneous accounts of previous pestilences describe them as damaging social relations. Yet, surprisingly, among the general population in Italy, interpersonal trust increased relative to prepandemic levels, and those who caught COVID-19 increased their trust in strangers. This effect seems ephemeral, however, as it declines as people become free of the infection.

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increased charity donations in the United States and in Italy (15); even a mere reminder of the negative consequences of the pandemic is shown to increase donations in England (16) and make US citizens more willing to prioritize society's problems over their own (17). Furthermore, longitudinal evidence shows that, relative to prepandemic levels, interpersonal trust increased during the first phase of the pandemic in Sweden (18), Korea (19), and the United States (20).

Yet, even if much evidence points toward a positive effect of natural disasters in general on prosocial behavior—but see Becchetti et al. (21) for an exception—pandemics, in particular, could lead to greater intolerance and discrimination (10). In a *New York Times* article written at the start of the COVID-19 pandemic, David Brooks summarized the evidence from many historical sources revealing anecdotally that, unlike "hurricanes and earthquakes, [that] can bring people together (…) pandemics generally drive them apart" (22). From Giovanni Boccaccio's *The Decameron* on the Black Death that hit Florence in 1348 to Daniel Defoe's *A Journal of the Plague Year* on the 1665 London epidemic, to several sources on cholera in 17th-century Venice and in 19th-century Naples, and the worldwide 1918–1919 Spanish influenza epidemic, the message is consistently that, as Defoe put it, "the danger of immediate death to ourselves, took away all bonds of love, all concern for one another" (22). This tallies with the contemporary research on the Black Death in Europe that unleashed mass violence toward minority groups (23–25), and the devastating Spanish flu that seems to have weighed negatively on social relations (26).

Some of the evidence on the first phase of the COVID-19 pandemic matches this historical evidence and indicates that donations decreased as the number of COVID-19 cases increased in Spain (27), while a survey experiment finds that priming people about the pandemic reduces social trust in four European countries, including Italy (28). Furthermore, a longitudinal study in The Netherlands finds that, on average compared to the prepandemic period, social trust declined in July 2020, although there was no effect among those who had been personally exposed to COVID-19 (29). Considering this conflicting evidence, we agree with Grimalda et al. (ref. 15, p. 2) that "it is then not clear whether exposure to natural hazards such as a pandemic will be associated with heightened prosociality among those affected."

To address the question of whether the pandemic is enhancing or eroding trust in our fellow humans, we study the Italian case. One of the worst affected countries in the world, as of May 4, 2022, Italy had 163,889 deaths, amounting to 2,718 deaths per million population (30). We deploy a combination of both measures and methods—a three-wave panel survey with a representative sample of the Italian adult population, an experiment embedded in the first wave of the survey, and secondary data on excess deaths by municipalities. Through the experiment, we seek to find out whether being primed about COVID-19 risk to health and welfare, or about the heightened pressure to show solidarity, causes variations in interpersonal trust. Through the panel survey, we investigate whether the infection, either personally experienced or via one's personal network, has an effect on an individual's trust, especially in strangers. (Note that we study a population in which everyone has been exposed to the threat of COVID-19, and our term of comparison is not the prepandemic level of trust but the level of trust of those who have had no experience of the infection.) We then measure community-level exposure by matching subjects in the survey with the measure of excess deaths recorded in their municipality of residence and checking whether it

correlates with interpersonal trust. Finally, by surveying the same respondents three times over a period of nearly a year, we probe whether the effects of exposure on interpersonal trust persist as the pandemic unfolds. We conclude by discussing the mechanisms that may account for our results.

Measures and Design

Between April 30 and May 19, 2020, that is, between the second and the third month of the lockdown imposed by Italian authorities, we surveyed a representative sample of Italian adults ($n = 1,163$). We then recontacted the same respondents between October 23 and November 4, after a period of low spread of the virus (wave 2), and again between February 5 and 19, 2021, after a period of high spread of the virus (wave 3) (31). The attrition was low, with 1,065 and 1,052 respondents taking part in wave 2 and wave 3, respectively. In total, 1,003 respondents participated in all the three waves of the panel.

Measuring Trust. We measure interpersonal trust with three items. First, in each wave of the panel, we included the standard question on generalized trust, which asks respondents "Generally speaking, do you think that most people can be trusted, or we need to be very careful?" Next, in waves 2 and 3, we included a question on "trust in Italians" routinely used in the past by the survey company that fielded our study. The advantage of this question is that it allows us a limited comparison between prepandemic and postpandemic trust for approximately half of our sample. Third, in each wave of the panel, we included the so-called "lost-wallet question." Originally designed by Soroka et al. (32), and inspired by an earlier field experiment (33), the question asks respondents how much, should they lose their wallet, they trust a neighbor, a police officer, or a stranger to return it. The respondents could choose from four possible answers: "Very likely," "Quite likely," "Slightly likely," or "Not at all likely." The version we use is that used by the Italian National Institute of Statistics (ISTAT).

By referring to a specific behavior (returning a wallet) and to specific categories of individuals (strangers, police, and neighbors), the lost-wallet question overcomes the two main shortcomings of the standard generalized trust question (34–39), and ensures that the respondents interpret the question in the same way. In addition, by not including the word "trust," the lost-wallet question does not make "trust" salient in respondents' minds, and their answers should stay neatly separated from what the question aims to measure. When subjects reply that they trust people to return their lost wallet, therefore, they imply that they trust that, generally, people are both sufficiently honest and willing to make the effort to help a stranger in need. By imagining that they lost a wallet, they imagine themselves to be in a position of vulnerability to countless other people who could find their wallet and not return it; in this case, vulnerability is accidental rather than chosen (as is in the trust game experiment), yet it measures trust understood as the belief in the trustworthiness of others, as all questions on generalized trust do.

In the case of COVID-19, the lost-wallet question has a further advantage with respect to the standard generalized trust question, for asking respondents to choose between "most people can be trusted" and "you can't be too careful" could lead people to mix up trust with caution. The standard question aim is to measure whether respondents exercise caution to avoid being cheated. However, in the context of a pandemic in which we need to be cautious in our social interactions for a

very different reason—anyone can be a carrier of a transmissible disease—this aim may be thwarted: There is now solid evidence that, even if we believe that most people can be trusted, we may still reply that one cannot be too careful (40).

Although we consider the lost-wallet question as the most accurate to capture trust in unknown others for the reasons mentioned above, for completeness and comparability with other research, we report the results of all our measures of trust. (See *Materials and Methods* for a detailed description of the trust measures.) The analysis indicates that trust as measured by the wallet question is weakly correlated with both the standard measure of generalized trust and the question on trust in Italians (*SI Appendix,* Table A2).

Virus Exposure. If we exclude the small minority of "denialists" who claim it is all a hoax, everyone else who knew about the virus must have perceived it as a threat to some degree; in this sense, everyone in our sample was "treated" relative to the period before the pandemic. To capture whether the degree of exposure to the COVID-19 virus correlates with differences in trust, we had, therefore, to measure the intensity of exposure, which we did in two ways. First, in each wave, we asked respondents whether, at some point since the pandemic started, they had suffered from COVID-19 symptoms—such as fever, dry cough, or loss of smell and taste. In wave 1, 13% replied "Yes," a figure identical to that found by a survey in the United Kingdom conducted between April 24 and May 1, 2020 (41); incidentally, both of these figures suggest that official statistics reporting confirmed cases of COVID-19 underreported the spread of the virus in the population. In the subsequent waves, 7% of the respondents reported having had symptoms between June and October 2020 (wave 2), while 9% reported experiencing symptoms between November 2020 and February 2021 (wave 3). As it became progressively easier to be tested, 37% (wave 1), 48% (wave 2), and 62% (wave 3) obtained diagnostic confirmation that their symptoms were, in fact, of COVID-19.

Next, as a measure of vicarious exposure to the coronavirus, we asked each respondent how many in their network had suffered from COVID-19. In wave 1, 17% of our sample knew of at least one family member, cohabitant, or relative; 40% knew of at least one friend or acquaintance; and 19% knew of at least one colleague who suffered from COVID-19. These shares increase in the subsequent waves, reflecting the cumulative effect and the spread of the virus (for summary statistics, see *SI Appendix,* Table A1). In the analysis, we use three items to test whether knowing a family member, a friend, or a colleague on a scale from zero ("not knowing anyone") to three ("knowing 3 or more people") is associated with a change in trust.

Lastly, as an ecological measure of the strength of the contagion in each respondent's wider community, we calculate excess deaths, that is, the difference between the number of deaths in the 2 mo preceding each survey and the average number of deaths in the same period in the previous 5 y. We calculated this ratio for each of the 621 municipalities where our respondents live. (See *Materials and Methods* for further description.)

Survey Experiment. In wave 1, our respondents were randomly divided into four groups, each assigned to one of three treatments or to a control condition. The treated groups were asked to read a text of ~110 words. Each text highlights one of three dimensions of the pandemic: risk to health, risk to livelihood, and as an enhancement of solidarity. The texts were distilled from reliable and publicly available sources. After reading them,

the respondents replied to the questions on trust. In the control condition, they moved directly to the outcome questions.

In the "risk to health" condition, we highlighted the uncertainties related to the diffusion of the virus, including, for example, the fact that (at the time of wave 1) we did not know when a vaccine would become available and whether there would be a second wave of the pandemic. In the "risk to livelihood" condition, based on projections by the International Monetary Fund and the International Labour Organization, we illustrated how the pandemic will lead to a global economic recession with serious consequences for the labor market. In the "solidarity" condition, we mentioned the need for global cooperation and solidarity to contain the pandemic and prevent future ones—we essentially presented the respondents with the rhetoric of "we are all in the same boat" voiced by the United Nations Secretary General, among many others. (See *SI Appendix,* section G for the texts of the treatments.) Balance checks indicate that there are no statistically significant differences between control and treatment groups regarding almost all the sociodemographic measures included in the survey (*SI Appendix,* Tables B1–B3).

Below, we present the results in three parts: We start from the survey experiment, followed by panel data analysis, in which we investigate the effects of exposure to COVID-19 within respondents. In the third part, we present over-time effects.

Experimental Results

Our survey experiment allows us to test whether being primed about COVID-19 affects interpersonal trust in the population regardless of the actual exposure to the virus. The experiment also helps us identify which aspect of the pandemic—health, livelihood, or solidarity concerns—could be the trigger of an effect on trust. In addition, it allows us to calculate the population average treatment effect of being exposed to the prime. In other words, we can discover the potential effects that just thinking about the threat the pandemic poses could have on trust among all Italians, rather than only on those who report COVID-19 symptoms.

To gain an overview, we use the first component of a principal component analysis (PCA) including all our measures of trust and find that the "risk to health" condition increases trust by 3.6 percentage points ($P < 0.05$, 95% CI [0.005; 0.067]; Fig. 1).

We can then break down the results by treatment to find out which condition is driving the overall increase. The solidarity condition does not affect any of our measures of trust (Fig. 1), while the "risk to livelihood" condition, that is, reminding respondents of how the pandemic might hit the economy and the labor market, causes no change in trust in the police or neighbors but an increase in trust in strangers, as measured by the wallet question, of five percentage points relative to the control group ($P < 0.05$, 95% CI [0.010; 0.095]), corresponding to 0.21 SD.

The "risk to health" condition, too, leaves trust in neighbors and police unchanged but has the largest effect on trust in strangers: When reminded of the uncertainties for our health that could be brought about by COVID-19, respondents are more likely to say that they trust strangers, by eight percentage points ($P < 0.001$, 95% CI [0.040; 0.121]), corresponding to 0.32 SD. The same condition also increases the standard measure of generalized trust—although the effect is not statistically significant at conventional levels (6.7 percentage points, $P < 0.1$, 90% CI [0.001; 0.133]). The effects are robust to alternative model specifications, controlling for sociodemographic covariates (*SI Appendix,* Table B4).
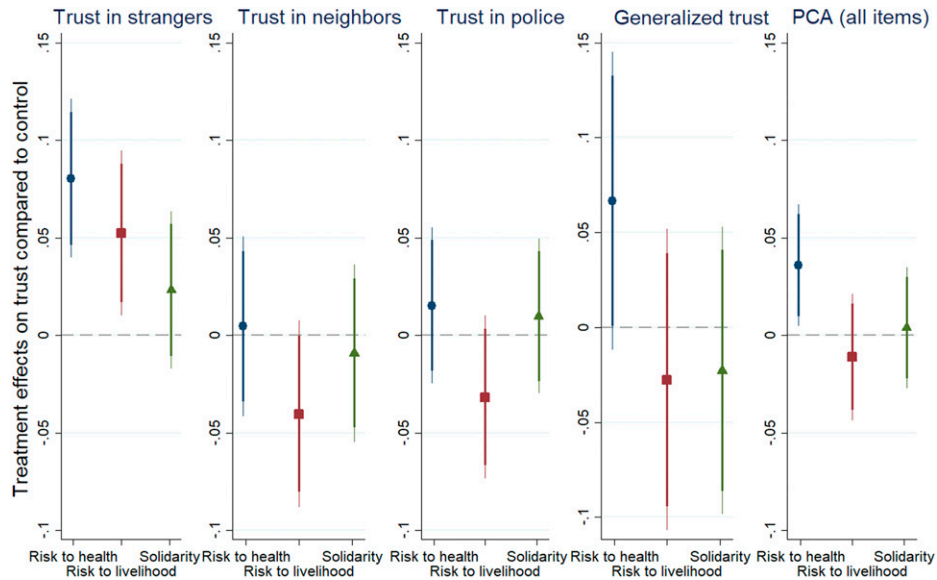
Fig. 1. Treatment effects on interpersonal trust (wave 1). Shown are effects on trust relative to control group (equal to value of zero on *y* axis). Dependent variables are rescaled from zero to one. "PCA" refers to first component of a principal component analysis of all four trust items. Estimates are based on Ordinary Least Square/logistic regression models 1 to 5 in *SI Appendix*, Table B4. Thin/thick vertical bars are 95/90% CIs.

We did not repeat the experiment in waves 2 and 3, but can test whether being treated with the "risk to health" condition in wave 1 still has an effect on trust in strangers. We find that, 5 mo later (wave 2, November 2020), treated respondents still trusted strangers approximately eight percentage points more ($P < 0.001$, 95% CI [0.034; 0.121]) than did those who did not receive any treatment (*SI Appendix*, Table B5). This persistent effect does not seem to depend on imbalances between treatment conditions in terms of sociodemographic covariates (*SI Appendix*, Tables B1–B3) and does not depend on differential exposure to the virus at the individual level (*SI Appendix*, Table B6). It may seem surprising, but the effect could be due to a mixture of inertia and consistency, namely, that, in wave 2, some respondents provided the same answer they gave in wave 1 just in order to be consistent, without reconsidering whether they still "believed" their first initial reply. In wave 3 (February 2021), 10 mo after the treatment administered in wave 1, the effect finally declines, and is not statistically significant when we introduce covariates in the model (*SI Appendix*, Table B5).

Exposure to COVID-19

We now consider whether actual exposure to the virus has altered interpersonal trust. Over and above what everyone was subjected to by simply existing, we consider three types of exposure: living in a community that has been particularly affected, knowing someone in one's network who has had the virus, and having personally suffered from the symptoms. We exploit the panel structure of our data using a within–between random-effects model (42), known as the "hybrid model" (ref. 43, pp. 32–38). This model allows us to detect, at the same time, whether there is an association between exposure to COVID-19 and interpersonal trust during the period of the panel study (the between effect), and whether a change in the exposure during the same period for specific individuals is associated with a change in trust (the within effect). (See *Materials and Methods* for further description of the model.)

Let us start with the between effect. First, we find that the association between excess death in respondents' municipality of residence and trust varies by wave. Considering all of the panel

data, excess deaths do not correlate with any of our measures of trust. However, during the first phase of the pandemic in spring 2020 (wave 1), those living in the most affected municipalities (fifth quintile) are 14 percentage points ($P < 0.01$, 95% CI [0.047; 0.230]) more likely to trust strangers (wallet measure) than those living in the least affected municipalities (first quintile) (*SI Appendix*, Table A3). As the pandemic progressed and the virus spread, the effect of excess death seems to disappear.

Next, knowing a family member or a colleague who suffered from COVID-19 symptoms does not correlate with any measures of trust. But knowing a friend who has suffered from COVID-19 symptoms is associated with higher trust in neighbors and other people in general (as measured by the standard question), but not with trust in police officers, strangers, or Italians (*SI Appendix*, Tables C1–C4).

Third, examining the direct exposure of individuals, we find that those who suffered from COVID-19 during the 10-mo period of our study trust strangers 6.5 percentage points more than those who did not catch the virus ($P < 0.001$, 95% CI [0.045; 0.086], corresponding to 0.26 SD). This effect, the largest, is also apparent in both generalized trust and trust in Italians, which increase by 15 percentage points ($P < 0.001$, 95% CI [0.113; 0.187]) and 5.7 percentage points ($P < 0.001$, 95% CI [0.035; 0.078]), respectively. The effects persist if we pool all trust items using PCA and grow further if we restrict the analysis to those who had diagnostic confirmation of their symptoms (*SI Appendix*, Tables C1–C4).

While the experiment allows us to claim that the effect of priming on risk of health is causal, the correlational results cannot guarantee that it is the exposure to the coronavirus that leads to higher trust. Inverse causation—that is, from trust to exposure—is possible, since people who are more trusting might be less guarded approaching others and catch the virus more frequently. There is indirect evidence that compliance with social distancing and "stay-at-home" guidelines is stronger in areas with high social capital and high trust in Europe and the United States (44–47), suggesting that inverse causality, while abstractly conceivable, is not so empirically justified.

Still, to make sure that we are dealing with a causal effect, we can look at the within-individual component of our panel
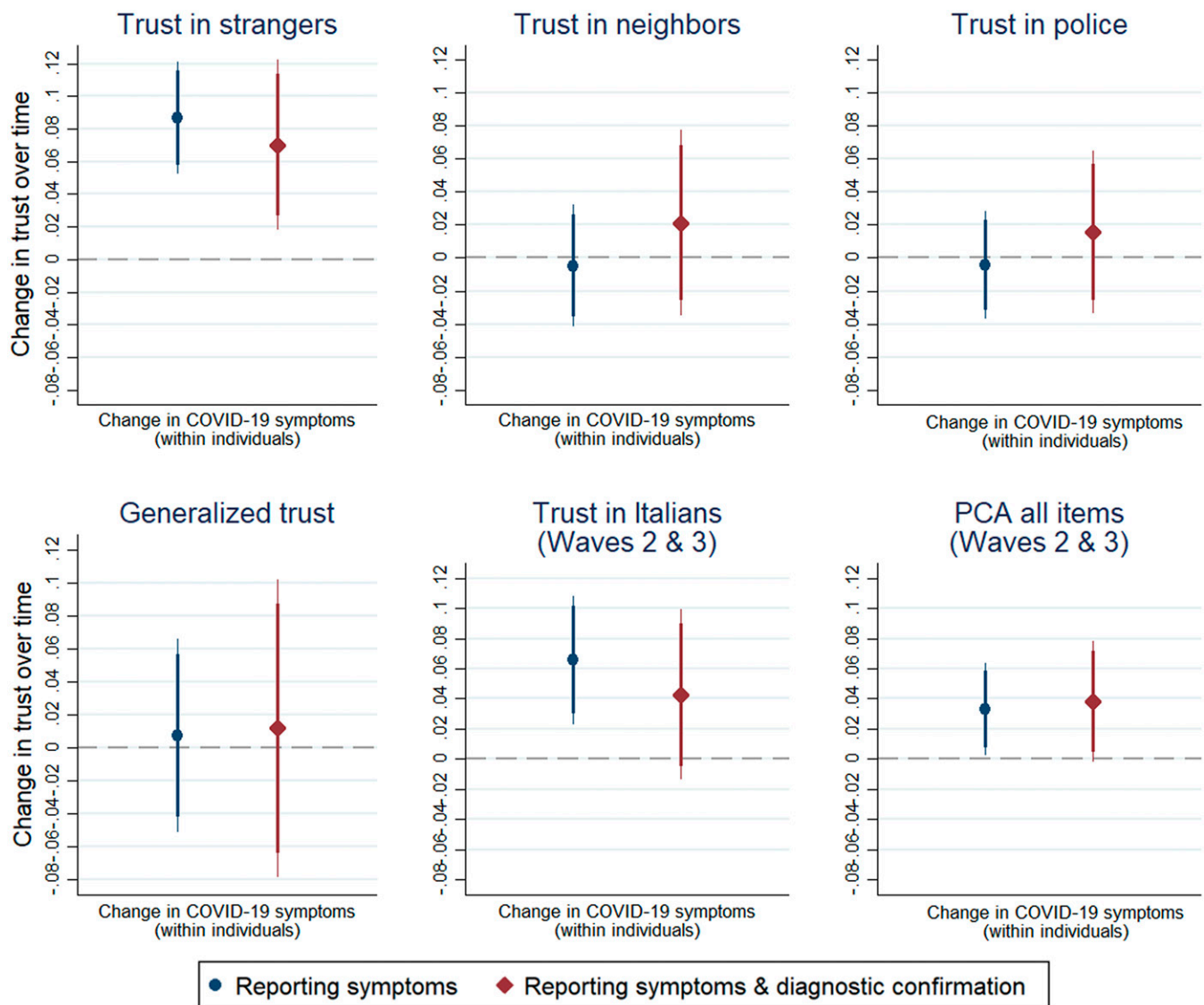
Fig. 2. Effect of individual changes in COVID-19 symptoms on interpersonal trust (panel data analysis, within-individuals effects). Estimates are from panel data analysis (within–between random-effects model), controlling for individual sociodemographics, municipality-level controls, treatment groups, and geographical area of residence. Estimates on Top Left are from model 2 in *SI Appendix*, Table C1; estimates on Bottom Right are from model 2 in *SI Appendix*, Table C4; all other estimates are from *SI Appendix*, Table C3. Dependent variables are rescaled from zero to one. "PCA" refers to the first component of a principal component analysis of all five trust items. Thin/thick vertical bars are 95/90% CIs.

data model. The within effects detect whether specific individuals who, from one wave to the next, experience a change in direct exposure to the virus also manifest a change in trust. If, while keeping all time-invariant individual characteristics fixed, we observe that developing COVID-19 symptoms during the panel is associated with an increase in trust, we can be confident that the former is causing the latter, and not the reverse.

If we take the first component of a PCA of all our measures of trust, we find that having COVID-19 symptoms during the period of the panel causes an increase in interpersonal trust of 3.2 percentage points ($P < 0.05$, 95% CI [0.002; 0.063]) (Fig. 2, *Bottom Right*, blue bar). If we take into account only those with diagnostic confirmation, we find a 3.8 percentage point increase, although the effect is not statistically significant at conventional levels ($P < 0.1$, 90% CI [0.005; 0.072]; Fig. 2, *Bottom Right*, red bar).

This within effect indicates that the persons who catch the virus during the period of our study increase their level of interpersonal trust when all measures are taken together. Looking now at each

trust item, we can find out what is driving this result: Developing COVID-19 symptoms has no effect on trust in neighbors or in police officers but leads to a substantial increase of trust in strangers (the lost-wallet measure) (Fig. 2, *Top Left*). Specifically, an individual who changes his/her status from having no symptoms to having COVID-19 symptoms increases his/her trust in strangers by nine percentage points ($P < 0.001$, 95% CI [0.052; 0.121], corresponding to 0.34 SD). Even introducing a stricter test, and considering only the respondents who received diagnostic confirmation, the increase is close, seven percentage points ($P < 0.01$, 95% CI [0.018; 0.122], corresponding to 0.27 SD). (See *SI Appendix*, Tables C1–C4 for complete results.) Those who catch the virus between wave 2 and wave 3 increase their trust in Italians by 6.5 percentage points ($P < 0.01$, 95% CI [0.023; 0.108]; Fig. 2, *Bottom Center*). By contrast, we find no effect on generalized trust (Fig. 2).

Another way to look at causality is to use cross-lagged models (48, 49), in which we regress our measure of trust in strangers in wave 2 (or wave 3) on exposure to COVID-19 and trust in strangers in previous waves. We find that those who suffered from
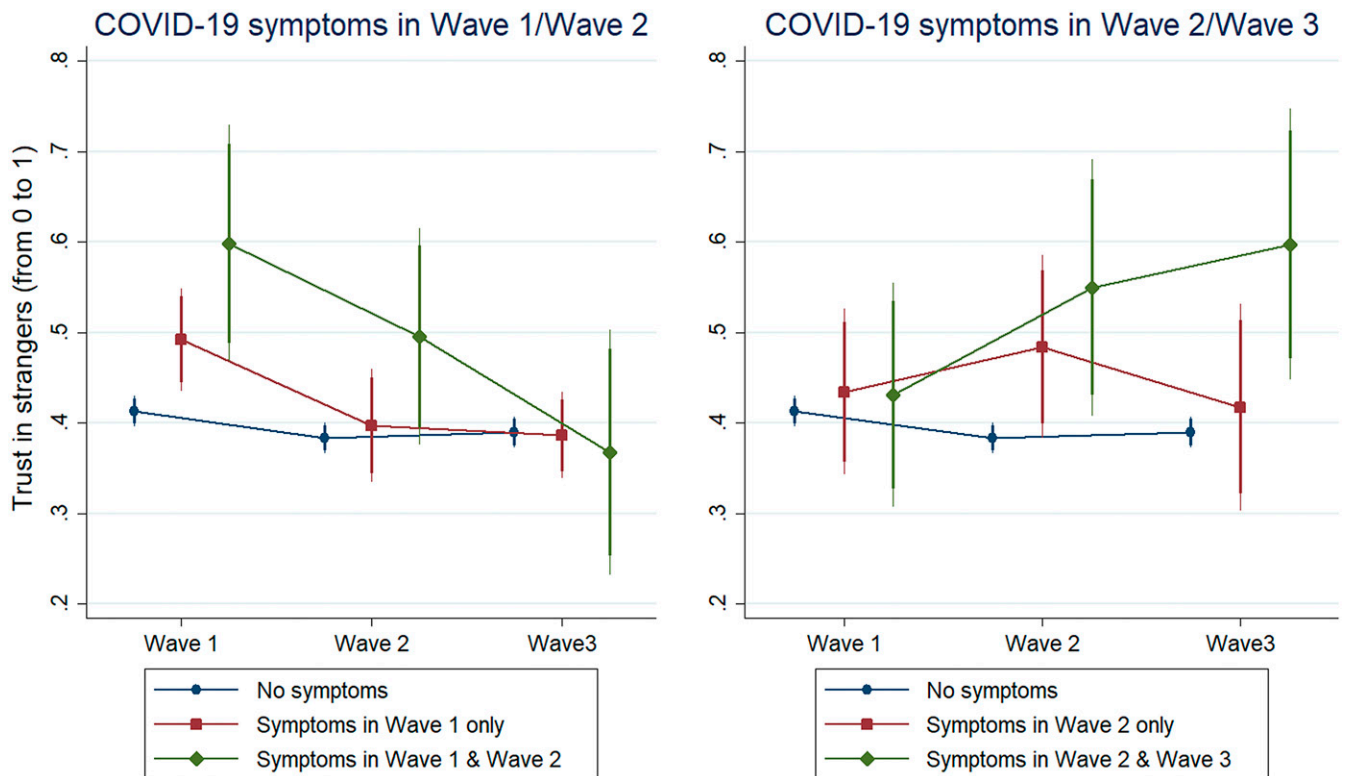
Fig. 3. Trust in strangers over time. Average levels of trust are based on OLS regression model interacting categories of individuals with COVID-19 symptoms with a wave variable, controlling for gender, age, education level, and geographical area of residence. SEs are clustered at the respondent level. Dependent variable is the likelihood that a stranger returns a lost wallet; values are rescaled from zero (not at all likely) to one (very likely). Thin/thick vertical bars are 95/90% CIs. For complete regression models, see *SI Appendix*, Table D1.

COVID-19 in wave 1 are nine percentage points ($P < 0.001$, 95% CI [0.021; 0.151]) more likely to trust strangers in wave 2, controlling for previous level of trust in wave 1 (*SI Appendix,* Table C5).

In sum, the strongest and most consistent finding of panel data analysis is the effect of direct exposure to COVID-19 on trust in strangers. These results tally with the results of our experiment and point forcefully toward a positive effect that experiencing the virus has on trusting unknown others.

Effects over Time

Does catching the virus lead to persisting higher levels of trust in strangers? To address this question, we analyze the trend of trust during the period of the panel across individuals with different exposure, and focus on trust in strangers. In particular, we investigate whether those who caught the virus at different points in time differ in their level of trust compared to those who, at no point, suffer from COVID-19. Furthermore, we distinguish between those who caught the virus once and recovered and those who continued to report COVID-19 symptoms across waves (see *Materials and Methods* for further description).

First, we find that trust remains substantially stable among those who did not suffer from COVID-19 during the panel (the blue lines in Fig. 3). Second, in line with cross-sectional analysis, we find that those who suffer from COVID-19 in wave 1 (Fig. 3, *Left*) and in wave 2 (Fig. 3, *Right*) trust strangers more than those who did not catch the virus. However, once people recover from COVID-19, their level of trust declines to a level that is not statistically different from the level of those who did not catch the virus, as the red lines in Fig. 3 indicate. On the other hand, trust declines less sharply if the

respondents continued to suffer from COVID-19 in wave 2 (Fig. 3, *Left*, green line) or does not decline at all if the respondents continued to suffer in wave 3 (Fig. 3, *Right*, green line). Among the latter group of people, trust remains steadily higher in wave 3 compared to those who never suffered.

These results suggest that the increase in trust in strangers due to individual exposure to COVID-19 might persist only as long as people believe they are infected by the virus. Once free from it, people slip back to trusting strangers as much as those who were not individually exposed to the virus. Importantly, however, these findings refer to additional increases in trust. They do not imply that interpersonal trust did not change during the pandemic relative to what it was before the pandemic among the whole population, including among the majority of people who did not catch the virus. Recovered individuals may "return" to a level of trust that is already higher compared to what it was before the pandemic. Since virtually everyone was affected by the pandemic, it is possible that interpersonal trust increased also among those who did not individually suffer from COVID-19.

As a limited test of this possibility, we retrieved data from a subsample of 522 panel respondents who had replied to the question on trust in Italians in previous polls carried out before the pandemic, between 2015 and 2019. The results indicate that, on average, among these respondents, trust in Italians compared to prepandemic levels increased by three percentage points in both waves in which we measured it (wave 2: $P < 0.01$, 95% CI [0.009; 0.054]; wave 3: $P < 0.01$, 95% CI [0.008; 0.053]). This increase in trust occurs regardless of whether respondents report symptoms of COVID-19 (*SI Appendix,* Table D2 and Fig. D1). This finding is in line with longitudinal evidence from different countries showing that interpersonal trust increased, on average, during the first phase of the pandemic (18–20).

Mechanisms

Why does the pandemic seem to have the same positive effect on people's trust as shown by other natural disasters? Ruling out the possibility that trust is fostered by "longer interactions during reconstruction [phases]" (ref. 2, p. 91), since the pandemic does not destroy physical capital, we identify three possible explanatory mechanisms.

A first mechanism that might promote trust in strangers could result from an increase in empathy. COVID-19 could enhance our sense of empathy toward fellow humans—driven by the idea that we are all facing the same invisible threat, we are all "in the same boat." Some general evidence indicates that empathic concerns toward vulnerable others promote prosocial behavior (50, 51), while some evidence specific to the COVID-19 pandemic (52) suggests that greater empathy stimulates compliance with social distancing and hygienic rules. Observing these effects might induce more trust in strangers. Our evidence, however, does not seem to support this conjecture. Our "solidarity" treatment condition, in which we remind respondents of the duty to show solidarity with the most vulnerable, does not lead to an increase in trust in strangers, regardless of the respondents' exposure to the virus. Even if empathy has increased, this does not seem to spill over and make individuals readier to rely on unknown others.

Second, we conjecture that those who received help during the pandemic may have learned that strangers are "better" than what they thought and have revised their trust upward. Anecdotal and survey evidence indicate that, in several European countries, including Italy, there was a surge in the number of people volunteering to help others in need (53–55). To test this mechanism, we asked our respondents whether they received help from strangers or volunteers before the pandemic, during the first lockdown (spring 2020), and between the second and third wave of the panel, from November 2020 until February 2021. The results show that those who suffered from COVID-19 and received help from strangers or volunteers during the pandemic (controlling for receiving help before the pandemic) trust strangers substantially more than those who were affected by the virus but did not receive help (Fig. 4, *Bottom Right*). This finding suggests that exposure to COVID-19 increases trust in strangers even more if people benefit from volunteers' help.

The third mechanism that we consider has to do with the fear of succumbing to the pandemic. Cassar et al. (ref. 2, p. 91) include, among the mechanisms that might enhance trust after a natural disaster, "an increase in the perceived probability that a similar event might occur in the future [which] increases the potential for needing help from others in the future." In a pandemic, which, unlike an earthquake, is not a one-off event but rolls on for an indefinite length of time, the future takes a particular form, as it seamlessly connects to the present, and the need of others may, indeed, occur at any time. Experiencing either the actual symptoms of the virus or just the realistic fear that we may be struck by it could make us feel more needy, more dependent on the support of others.

This conjecture is strengthened once we realize its close links with a well-tested theory that argues that trust is higher when people have strong reasons to identify strangers on whom they can rely, and, in that quest, they seek "outward exposure." Known as the "emancipation theory of trust," it was proposed by Toshio Yamagishi and his colleagues (56–58) in a completely different context than a pandemic, namely, to explain why US citizens, members of a highly mobile society, were found to be more trusting of strangers than the Japanese, who belong to a more traditional and committed society that relies on family and groups. The theoretical argument maintains that, the less encompassing traditional or institutional ties are, the more people feel encouraged to be open to and actively look for strangers on whom they can count. [Three studies found supporting evidence for the emancipation theory by looking at the effects on trust of the strength of family ties (59–61).] The pandemic would be a sharply different source—transient and dramatic rather than structural and habitual—but could still boost the propensity to outward exposure. Perceiving their health to be at risk could induce people to be more open toward others, to be more eager to learn whether they could rely on them in case of need, or even just to feel more optimistic about others' trustworthiness through wishful thinking—when in dire need, any hand starts looking like a helping hand. In fact, the short-lived nature of the effect suggests more of an emotional mechanism than a rational one.

An implication of this conjecture is that people in weaker positions, whether social or financial, should react more strongly when developing the symptoms of the infection, and trust strangers more than similar people in stronger positions. Kye and Hwang (ref. 19, p. 4), for example, find that, during the lockdown in spring 2020 in Korea, "trust improved more among the lower class than among the upper class." To test these implications, we analyze a series of interactions between individual exposure to COVID-19 and different sociodemographic indicators within our panel model.

First, we consider two measures of social isolation: whether the respondents 1) had any close relative alive at the beginning of the pandemic in February 2020 and 2) lived alone (Fig. 4, *Top*). In line with the expectations, trust in strangers increases among those who suffered from COVID-19 and either did not have a family or lived alone. Those who lived alone, in particular, trust strangers significantly more than those who caught the virus but lived with other people.

Next, we look at economic conditions (Fig. 4, *Bottom Left*) using a self-reported measure recoded in two categories: those who state that their income allows them to live comfortably (good condition) and those who perceive some difficulties or struggle to reach the end of the month (not good condition). In line with expectations, and the finding of the Korean study, we find that, among those who reported symptoms, trust in strangers is higher if they perceive economic difficulties, compared to those in a good economic situation. In the supplementary analysis, we present suggestive evidence that, being in need, which supports the third mechanism, and receiving help, which supports the second mechanism, do not exclude each other, but have either an independent or additive effects on trust (*SI Appendix*, Fig. C1).

Discussion

We set out to find out whether the COVID-19 pandemic has affected interpersonal trust, focusing on Italy, one of the worst affected countries. We measure trust with various items, including the lost-wallet question, distinguishing between police, neighbors, and strangers, and the standard survey question on generalized trust in unspecified others.

A major result is the virtual absence of any negative effect of the pandemic on trust, in contrast with what was reasonable to expect relying on the literature, historical and contemporary, on other pandemics. Instead, when we pool all our measures of trust together, we find that individual exposure to COVID-19 leads to an increase in interpersonal trust of three percentage points.
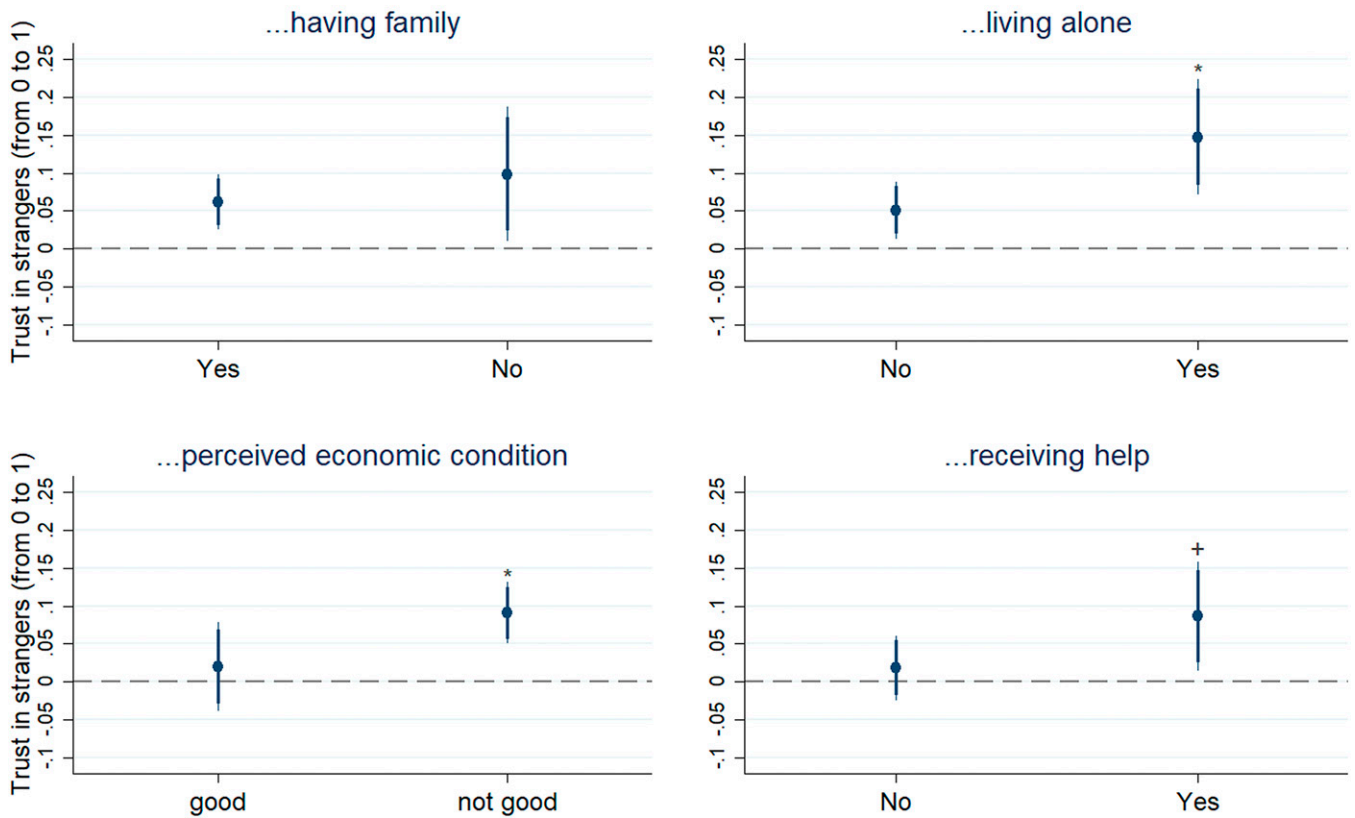
Fig. 4. Testing mechanisms (panel data analysis of between effects, interaction models). Shown are average marginal effects on trust in strangers based on interactions between suffering from COVID-19 (equal to one if suffered at least once during the panel) and sociodemographic indicators. The models include the same set of covariates included in Fig. 2. The value of zero corresponds to those who did not have symptoms. Dependent variable is the likelihood that a stranger returns a lost wallet; values are rescaled from zero (not at all likely) to one (very likely). Thin/thick vertical bars are 95/90% CIs. Cross and star signs indicate that the interaction is statistically significant (+ = $P < 0.1$, * = $P < 0.05$). For complete regression models, see *SI Appendix*, Tables C6 and C7.

When we break the results down by each trust item, we find no significant change in trust in police officers and neighbors, and some marginal positive effects on generalized trust. However, our key finding shows that individual exposure to the pandemic has increased trust in strangers. We reach this result through a variety of methods, whose outcomes converge on the same conclusion. It emerges for those who live in the most-affected communities (in the first wave of our panel), for the priming experiment, and for those who report symptoms of the infection at any point in the span of time our panel study covers. From the panel analysis, we find that trust increases by between seven and nine percentage points. From the experimental analysis, we find that reminding respondents of the risks for our health related to COVID-19 increases trust by eight percentage points. Both the experiment and the within-effect analysis of panel data support the causal interpretation of the increase in trust and rule out the possibility of inverse causality.

As to the nature of the cause, our ex-post analysis points at two mechanisms that could explain the increase in trust. First, experiencing higher than expected helpfulness from strangers who mobilize during the pandemic could result in a change of beliefs about trustworthiness. Next, the heightened health risk could make the need for support from others become salient and stimulate putting greater trust in them. Both mechanisms could have a rational source, adjusting one's beliefs to new information in the former mechanism or wanting to learn about others trustworthiness in the latter; or they could be driven by an emotional response, sympathy for generous fellow humans, in the former case, or wishful thinking, in the latter case. In fact, the short-lived nature of the effect makes an emotional source more plausible than a rational one.

Our finding seems prima facie aligned with the predominant finding in the literature on the positive effects of natural disasters on trust. However, there are differences that make the comparison imperfect. Our research is in the unique position of being carried out during a protracted pandemic, rather than in the aftermath, as is the case with most other natural disasters or with historical studies of previous pandemics. Our finding that the effect on trust of being individually exposed to COVID-19 declines once people recover from the virus suggests that the effect of COVID-19 may be more ephemeral than that produced by other natural disasters. However, since virtually everyone was exposed to the threat of the virus, it is possible that the COVID-19 pandemic led to a generalized increase in interpersonal trust relative to pre-pandemic level, regardless of whether people individually caught the virus, as longitudinal evidence (18–20) and our own analysis indicate.

We may, in conclusion, wonder how representative the case of Italy is of the effects on trust the pandemic is having in other countries. With respect to the size of the effect, it is, at present, difficult to say, for there are no studies that are closely comparable to ours. With respect to the direction of the effect, except for research by Lo Iacono et al. (29) that finds no change in the level of trust among those who suffered from COVID-19 in

the first phase of the pandemic in The Netherlands, our results are in line with longitudinal studies showing that interpersonal trust increased in different countries at the beginning of the pandemic (18–20). Despite disrupting human lives, the pandemic does not seem to have disrupted interpersonal relations.

Materials and Methods

Institutional review board approval for the study was granted by the Ethics Committee of the Fondazione Collegio Carlo Alberto, Turin, Italy. In wave 1, we surveyed a quota sample matching the adult Italian population on gender, age, and geographical area of residence ($n = 1,163$). We included our questions in an omnibus study conducted by the survey company SWG. All participants provided informed consent. Due to space limitation, we included a first set of questions and the experiment in a first round between April 30 and May 4, 2020, and then reinterviewed the same participants with an additional set of questions between May 14 and 19. (For further details on data collection, see *SI Appendix, section E*.) Ninety-two percent of the initial sample also completed wave 2, while 90% also completed wave 3. In order to obtain a representative sample, in cross-sectional analysis, we weighed each sample by level of education and political preferences as expressed in the vote in the 2019 European elections.

We measure interpersonal trust using different items. In each wave of the panel, we include the lost-wallet question and the standard question on generalized trust. The lost-wallet question reads as follows: "Imagine that you have lost your wallet. In your opinion, how likely it is that one of the following people will return the wallet to you?" The respondents could choose among four possible answers ("Very likely," "Quite likely," "Slightly likely," and "Not at all likely"), for three categories of people (a neighbor, a member of the police, and a stranger). The lost-wallet question is the same used by ISTAT. The standard question on generalized trust reads as follows: "Generally speaking, do you think that most people can be trusted, or we need to be very careful?" The respondents could choose either "Most of the people can be trusted" or "We need to be very careful." In addition, in waves 2 and 3, we include a question on "trust in Italians" that is routinely used by the survey company that fielded our study. The question asks how much trust the respondent has in Italians, with four possible answers ("No trust," "Little trust," "Quite some trust," and "Very much trust"), and a residual option for "Prefer not to reply."

To measure individual exposure to COVID-19, in wave 1, we ask, "Since the beginning of the year have you personally suffered from COVID-19 symptoms, such as fever, dry cough, or loss of smell and taste?" We repeat the question in waves 2 and 3, referring to the period in between the end of the previous interview and the current interview. We further ask whether they received "diagnostic confirmation that these symptoms were actually due to COVID-19 through a COVID-19 test or a serological test." For the first period of the pandemic, we asked the question about the diagnostic test retrospectively in wave 2. Our estimate of the share of people with confirmed COVID-19 symptoms in wave 1 is conservative, because 13 respondents with COVID-19 symptoms in wave 1 did not participate in wave 2.

To measure excess death, we retrieve official mortality data at the municipality level for the periods March–April 2020 (wave 1), September–October 2020 (wave 2), and December 2020 to January 2021 (wave 3), and compare them with the average mortality in the same periods in the years 2015–2019. Data were released by ISTAT, and we retrieved them on April 15, 2021 from https://www.istat.it/it/archivio/240401 (62). Excess death has the advantage of ruling out geographical discrepancies in the number of reported cases of COVID-19 due to differences in testing frequencies. Furthermore, it overcomes the problem of underreporting COVID-19-related deaths (63). The measure, however, is sensitive to population size: In small municipalities, small variations in deaths in 2020 compared to previous years translate into large percentage variations. To alleviate this problem, we divide the measure into quintiles. In addition, we weigh the original measure by population size, assigning smaller weights to smaller municipalities.

In the cross-sectional analysis, we analyze the data using standard regressions models. We rescale all dependent variables from zero to one and treat them as continuous variables, except from the standard question on generalized trust that is a dummy variable. In each model, we include individual-level and municipality-level covariates to control for confounding factors. At the individual level, we control for factors that have been shown to correlate with the spread of COVID-19, such as respondents' gender (64), age (65), and household condition, that is, whether respondents live by themselves or with other people (66). (But see evidence from Arpino et al. (67) casting doubt on the link between intergenerational relationships and lethality of COVID-19.) In addition, we control for respondents' education level, the employment situation during the lockdown (separating those who worked from home from those who continued working outside home), and perceived economic condition.

At the municipality level, we control for a number of indicators provided by ISTAT for the year 2018, which might correlate with the spread of the virus, including the number of inhabitants (logged), the population density (logged), the ratio of males over females (deciles), and the share of people aged above 65 y (deciles). In addition, we control for the employment rate in 2018 (deciles). We retrieve employment data from *Il Sole 24 Ore* on 8 June 2020, from https://www.infodata.ilsole24ore.com/2019/04/16/39185/ (68). Lastly, in each model, we include an indicator for the geographical area of residence (North-West, North-East, Centre, South, and Islands). (See summary statistics in *SI Appendix, Table A1*.) Since including covariates might artificially inflate statistical significance (69), we also run naïve regression models in which we control only for geographical areas and basic sociodemographic factors (gender, age, and education), obtaining substantially similar results.

In panel data analysis, we use a within–between random-effects model (42), also known as the "hybrid model" (ref. 43, pp. 32–38). This model allows us to address the problem of the correlation between covariates and residuals in random-effects models, while permitting estimation of variation both within and between individuals. The model can be described by the following equation:

$$y_{it} = \beta_0 + \beta_1(x_{it} - \bar{x}_i) + \beta_2\bar{x}_i + \beta_3 z_i + \nu_i + \varepsilon_{it},$$

in which y is the dependent variable (trust) for individual i at time t, x corresponds to our time-varying independent variables (exposure to COVID-19), and z corresponds to a series of time-constant independent variables that vary only across individuals. The coefficient β_1 represents within-individual effects, while the coefficients β_2 and β_3 correspond to between-individual effects. This model allows us to estimate, at the same time, whether both 1) average differences in exposure to COVID-19 (the "between" component) and 2) individual changes in individual COVID-19 exposure (the "within" component) correlate with changes in trust.

To analyze over-time effects, we stacked the datasets of each panel wave into a single dataset, including a "time" variable corresponding to each wave. We then interacted our time variable with different categories of individuals, depending on whether and when during the panel they suffered from COVID-19. We cluster the SE at the respondent level.

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