Containing the Virus or Reviving the Economy? Evidence from Individual Expectations during the Covid-19 Epidemic[1]

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Abstract

How does an epidemic affect individuals' expectations on economic prospects? We implement an incentivized longitudinal online survey with randomized controlled trials during the COVID-19 epidemic in China to answer this question. We find that lower number of confirmed COVID-19 cases significantly increases individual's expectation on GDP growth. However, individuals do not update their expectations when information on work resumption rate is provided in the RCT. Our finding conveys the message that, *during* an epidemic, containing the spread of the disease should be prioritized than resuming economic activities, at least from the perspective of maintaining positive economic expectations among individuals.

Keywords: COVID-19; Expectation; Longitudinal Survey; RCT
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During the COVID-19 public health crisis, policy makers face a tough tradeoff between containing the coronavirus using aggressive measures such as lockdown and stay home quarantine, and reviving the economy which encourages the sustaining of normal economic activities. In this research, we aim to understand whether individuals' expectations on economic prospects are more affected by the severity of COVID-19 epidemic, or the level of ongoing economic activities. In other words, do people care more about containing the disease or sustaining normal economic activities when forming their economic expectations during an epidemic?

Individuals' economic expectations are important outcomes to study because expectation may affect individual's behavior and thus impact economic performance at the aggregate level. For example, an anticipation of good times ahead leads to a fall in current unemployment, a rise in inflation, and a tighter monetary policy (Leduc and Sill 2013). Another example is that higher household inflation expectations are associated with more pessimistic views of households' real income and lead to reduced spending on durables (Coibion et al. 2019). Given the behavioral consequences of economic expectations, it is important to understand how individuals form their economic expectations, and revise their expectations when new shocks such as an epidemic arrive.

In this study, we analyze individuals' economic expectations during the COVID-19 epidemic in China using an online longitudinal survey of approximately 1,900 individuals from seven provinces in China conducted from late February to mid-March of 2020. In each wave, we ask incentivized questions regarding respondents' expectations on GDP growth rate in the first quarter of 2020, the period that Chinese economy was heavily affected by the COVID-19 epidemic, as well as their expectations on a few other economic indicators.

We carry out the research in two stages using both quasi-natural experiment and randomized controlled trials (RCTs). In the first stage of the analysis, we study the impact of the severity of COVID-19 epidemic on individual's economic

expectations. Specifically, we match individual's revision of economic expectation between two waves with the number of COVID-19 new cases in the city that he/she lives in. Given that we conduct three waves of survey on the same respondents, we can measure each respondent's revision on economic expectation twice. Using an individual fixed effect model, we can then study the causal impact of the number of COVID-19 new cases at the city level on individual's revision of economic expectation, assuming that the number of COVID-19 new cases between the two waves (approximately 6-7 days) in a city is an exogenous information shock to individuals.

In the second stage of the analysis, we study the impact of economic recovery *during* the COVID-19 epidemic on individuals' economic expectations from two perspectives. First, we elicit respondents' belief on the current level of economic recovery in China, measured as a percentage compared to the normal level of economic activities (i.e., the so-called work resumption rate in China), and examine whether respondents' perceived work resumption rate would affect their economic expectations based on an individual fixed effect model. Second, we implement a randomized controlled trial with information treatment in the third wave of the survey. More specifically, after eliciting respondents' pre-treatment economic expectations and perceived work resumption rate, we randomly divide the respondents into five groups. In the baseline group (T0), we provide the current level of work resumption rate in China measured by the AI experts at Tsinghua University. In the other four treatment groups, we provide additional information on the work resumption rate in some selected cities, including the major city with the highest (T1) and lowest (T2) levels of work resumption rate, Beijing (T3), and the provincial capital of the individual's residing province (T4). After the information treatment, we ask the respondents to revise their economic expectations. We aim to understand whether individuals revise their economic expectations according to the perception gap of the economic recovery level, and

whether the way that the information is presented would affect their revision of economic expectation.

There are three main findings. First, lower number of new COVID-19 cases in a city between the two waves significantly increases local residents' expectations on GDP growth rate. On average, a one standard deviation (106.88) reduction of new COVID-19 cases within the past 6-7 days would lead to an upward revision of GDP in China, in Hubei province, and in their own province in Q1 2020 by 0.289%, 0.128% and 0.203%, respectively. In addition, we also explore the "extensive margin" and "intensive margin" of the new COVID-19 cases. In particular, a switch from positive number of new cases to zero causes an upward revision of GDP growth rate in Q1 2020 in China by 0.718%, which is a large magnitude relative to the average expectation (9.06% in wave 1 and 8.76% in wave 2). Our results are robust to the choice of alternative model specifications and different criteria of sample selections. Overall, the results suggest that, in an epidemic such as COVID-19, the success in containing the virus will lead to a significant upward revision of economic growth expectation among individuals.

Second, individuals do not update their belief on economic expectations when randomized information on work resumption rate is provided. Specifically, the RCT results suggest that the relationship between the respondent's perception gap of work resumption rate and his/her revision on economic expectation after getting the actual work resumption rate information is insignificant for all the randomized groups. In other words, individuals neither revise their expectation based on the perception gap of the economic recovery level, nor respond to different information treatments. The results indicate that the level of economic recovery, regardless of how the information would be presented, have little or no impact on individuals' economic expectations.

Third, we consider the impact of both the severity of the COVID-19 shock and the level of economic recovery together on individual's economic expectations.

Using a horserace model by controlling both the number of new COVID-19 cases in a city and individual's perception on work resumption rate, we still find that the decrease in the number of new cases significantly leads to upward revision of expectations on economic growth, while individuals' perception changes on work resumption rate are not correlated with their revisions on economic expectations (conditional on individual fixed effect). Overall, the findings indicate that individuals' economic expectations are significantly affected by the severity of COVID-19, but not affected by the level of economic recovery.

Our research is related to the literature studying the formation of individual expectations, especially the recent works studying inflation expectation and home price expectation using incentivized random controlled trials embedded in online surveys (Armantier et al. 2016; Armona, Fuster, and Zafar 2019; Fuster et al. 2018; Kuchler and Zafar 2019). In this literature, our paper is the first research to document the impact of epidemics on economic expectation. Combining offline exogenous shocks with online information intervention, we show that epidemics significantly drives down individuals' expectation on economic growth. More importantly, our research outcome conveys the message to policy makers that containing the spread of disease should be prioritized than resuming economic activities, at least from the perspective of maintaining positive economic expectation among individuals.

Our research also contributes to the literature evaluating the economic impacts of epidemics and related policies. Sands et al. (2016) and Fan, Jamison, and Summers (2016) provide systematic estimates on the global economic costs of epidemics. Besides the studies on the 1918-1920 influenza (Barro, Ursua, and Weng 2020; Bootsma and Ferguson 2007; Correia, Luck, and Verner 2020), the influenza diseases in France (Adda 2016), Ebola (Huber, Finelli, and Stevens 2018) and H1N1 (Yoo, Kasajima, and Bhattacharya 2010), an emerging number of very recent works focus on the ongoing COVID-19 epidemic. Chinazzi et al. (2020), Fang,

Wang, and Yang (2020), Lai et al. (2020), Qiu, Chen, and Shi (2020) and Zhang et al. (2020) investigate whether, and to what extent, the lockdown measures in Wuhan, China helped control the virus spread. Atkeson (2020) provides a rough estimate on the economic impacts of COVID-19 in the U.S. Fetzer et al. (2020) measures the effect of COVID-19 on economic anxiety in U.S. To our best knowledge, we are the first to focus on the impact of COVID-19 on individuals' economic expectations. We believe that our findings may provide policy implications to other countries facing a tradeoff between containing the disease and sustaining economic vibrancy.

The paper is organized as follows. Section I introduces the background of the COVID-19 epidemic in China; Section II explains the survey design and implementation, and discusses the characteristics of the survey respondents; Section III introduces the research design, including the identification strategy using exogenous shocks on COVID-19 severity and the RCT on information treatment; Section IV shows the main results on the impact of COVID-19 on economic expectation; Section V shows the impact of economic recovery on economic expectation; Section VI concludes the paper.

I. Background on the COVID-19 Epidemic in China

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), or previously known as the 2019 novel coronavirus (2019-nCoV). The majority of COVID-19 infections result in mild symptoms; however, some progress to much more severe symptoms such as multi-organ failure, especially for more vulnerable population such as higher-age cohorts.[2] While the origin of the virus is still unclear, the earliest known

[2] See Guan et al. (2020) and Li et al. (2020), among others, for more details about the clinical characteristics of COVID-19.

infections occurred in Wuhan, the capital city of Hubei province, China around early December, 2019. It has since spread to other cities within Hubei province, as well as other Chinese provinces. As shown in Figure I, confirmed cases of COVID-19 in China started to surge since mid-January, 2020. By March 25th, 2020, there were totally 81,285 confirmed cases in China, including 50,006 cases in Wuhan, 17,795 cases in other cities of Hubei provinces, and 13,484 cases in other provinces, and the average case fatality rate was around 4%.[3]

On the one hand, there has been no vaccine or specific antiviral treatment for COVID-19. On the other hand, the virus is alarmingly contagious. It typically spreads during close human-to-human contacts via, for example, respiratory droplets. The existing literature concludes in an estimate of the basic reproduction number (R_0), the key indicator on the virus transmissibility, around 3, which is comparable to or even higher than SARS and H1N1 (see Liu et al. (2020) for a review). In addition, several characteristics of the virus make it difficult to accurately identify infected persons through surveillance for severe respiratory diseases, such as infectiousness during the incubation period, the infectivity of asymptomatic patients, and the high proportion of clinically mild cases (Guan et al. 2020; Li et al. 2020). Therefore, it is highly challenging to cope with the epidemic purely via medical efforts. By contrast, the non-pharmaceutical intervention through restricting human mobility becomes a more effective way to control the virus spread and manage the epidemic.

Facing the COVID-19 epidemic, the Chinese government implemented a series of unprecedented human-mobility restriction actions since late January, 2020, when the severity of the epidemic became apparent and medical scientists reached a consensus on the human-to-human transmissibility of the virus. On January 23, 2020, the government announced an immediate quarantine of the whole city of

[3] Unless otherwise stated, all the statistics numbers in this section are reported by the National Health Commission, China.

Wuhan, a megacity with a total population of around 11 million, followed by several measures issued in the next few days to further enhance the quarantine. The airport, railway stations and highways in Wuhan were all closed, and population outflows from Wuhan to other cities were strictly banned. The within-city mobility was also highly restrictive: all local public transport services were suspended; most of the public facilities, such as schools (including universities), restaurants, cinemas, parks, were closed; most firms were required to temporarily shut down; residents were required to stay at home, except medical staffs and other employees maintaining the basic city operation. Within the next few days, all other cities in Hubei province implemented identical lockdown measures. The other provinces in mainland China also imposed similar restrictions on human mobility, although the detailed measures varied with the severity of the epidemic. In particular, after the central government extended the public holiday of Chinese New Year from January 30 to February 2nd, most provinces further extended it for another 1-3 weeks. Employers were also encouraged or even required to arrange their employees to work from home.

All these measures substantially reduced both the between- and within-city human movement in China, and arguably effectively helped to keep the virus spread under control. As shown in Figure I, the national-level daily number of new cases continued to increase until around February 4th, with the peak of about 3,900 daily new cases, and then started to decrease steadily since around mid-February. There had been essentially no new locally confirmed cases in mainland China since March 18th, 2020, although the number of imported cases started to rise since mid-March. Several studies point out that the human-mobility restrictions greatly contributed to such a relatively quick control of the epidemic in mainland China (Chinazzi et al. 2020; Fang, Wang, and Yang 2020; Lai et al. 2020; Qiu, Chen, and Shi 2020; Zhang et al. 2020). For instance, the empirical analysis by Fang, Wang, and Yang (2020) suggests that the number of COVID-19 cases would be 64.8% higher in cities

outside Hubei province and 52.6% higher in the non-Wuhan cities inside Hubei province without the lockdown measures in Wuhan. Chinazzi et al. (2020) concludes that the quarantine in Wuhan also contributed to delaying the global epidemic progression.

Nevertheless, the national-level drastic human-mobility restriction actions in China also resulted in huge downward pressure of economic growth, at least in the short term. As depicted in Figure I (right axis), between February 3rd and 9th, the first week after the public holiday, the national-level average work resumption rate was only around 20%, compared with the same period in the previous year.[4] Although the official statistic on GDP growth rate has not been released yet, the existing data on other economic indicators has already revealed early signals of substantial economic losses. According to the statistics of National Bureau of Statistics, China, in the first two months of 2020, the national-level investment on fixed assets decreased by 24.5% compared with the same period of the previous year; the total value-added of industrial firms decreased by 13.5%; and the total retail sales of consumer goods decreased by 20.5%. Several sectors that rely on intensive human-to-human contacts witnessed huge losses; for instance, the national-level total sales of the catering industry decreased by 43.1% in the first two months of 2020.

With the COVID-19 epidemic under control, the Chinese government started to gradually relax the human-mobility restrictions and to devote more efforts to the economic recovery since late February, 2020. In a speech on February 23th, 2020, President Xi Jinping explicitly stated that the government should "coordinate the prevention and control of COVID-19 and economic and social development". He also set out eight specific requirements on resuming the nation's economic

[4] The data was publicly released and daily updated by Research Institute of Information Technology and Tong Heng Urban Planning and Design Institution, Tsinghua University, based on analysis on the mobile phone signaling data. The data are available at https://rw.uidashi.com/.

activities in an orderly way, such as tax-cut measures on targeted groups and measures on stabilizing employment. Since then, non-Hubei provinces with relatively lower epidemic risks gradually lifted the human-mobility restriction measures, and released a series of policies to encourage economic activity resumptions. The national-level average work resumption rate steadily climbed to around 75.0% as of March 24th (Figure I). As a last step, the local government of Hubei province announced that, all the cities in Hubei province (excluding Wuhan) would gradually relax the restrictions since March 25th, 2020, and, finally, Wuhan would remove the restrictions on April 8th, 2020.

II. Data

A. Survey Design and Implementation

We design and implement the internet-based survey (in Chinese) of a panel of approximately 1,900 individuals from seven Chinese provinces in February and March, 2020.[5] The survey was conducted based on a mini program imbedded in WeChat (the most popular social networking mobile application in China) specially designed for this survey. A professional online marketing company helped recruit respondents via publicly-released online advertisements. Figure A.1 in the Appendix shows the screenshots of the mini program used for the survey. The longitudinal survey consists of four waves in total. The 1st wave was implemented on February 29th and March 1st, 2020. While it is infeasible to implement a

[5] The seven provinces include Hubei, the province with the most severe COVID-19 epidemic, and Hunan, Guangdong, Fujian, Sichuan, Liaoning, and Inner Mongolia. We choose the other six provinces using two criteria. First, we rank the 30 provinces in mainland China (other than Hubei) according to the cumulative number of confirmed COVID-19 cases by February 20th, 2020, and choose two from the ten provinces with the most number of cases (Hunan and Guangdong), another two from the ten provinces with the fewest number of cases (Liaoning and Inner Mongolia), and another two from the rest of the ten provinces (Sichuan and Fujian). Second, these six provinces come from the eastern, middle and western regions of China, including both the northern and southern parts.

probability sampling in recruiting the respondents, we adopt the quota sampling method with the quota listed in Table A.1 in the Appendix. We set up a few questions asking the current location (city and province), gender and age of the respondent at the beginning of the questionnaire, and only allow the respondents who fit the quota to proceed and submit their responses. A total of 1,905 valid responses were collected from the first wave of the survey, coming from 82 cities in the seven provinces. As listed in Table I, the sample distribution well fits the designated quota. These 1,905 respondents were then invited to participate in the subsequent waves of the survey in the following weeks (specifically, March 6th and 7th for the second wave, March 12th and 13th for the third wave, and March 18th and 19th for the fourth wave, respectively). The mini program sent a reminder to the respondents when the next round of survey was up. Participants would not be invited for the next wave if they did not complete the previous wave. In total, 1,575, 1,284 and 1,169 respondents took part in the second, third and fourth waves, implying an attrition rate of 17.3% from the first wave to the second wave, 18.5% from the second wave to the third wave, and 9.0% from the third wave to the fourth wave, respectively. We only include the first three waves in this study because the fourth wave is designed differently to serve a different study though it utilizes the same sample.

The questionnaire of the survey includes multiple sections of questions, which remain largely consistent for all the three waves.[6] We particularly focus on respondents' economic expectations. The first wave of survey asked respondents' perception about the national-level annual GDP and CPI growth rates in 2019. Then, in each of the three waves, we elicit respondents' short-term expectations on the year-on-year (y-o-y) real GDP growth rates of Q1 2020 of the nation, Hubei

[6] As exceptions, we only include questions on time-invariant attributes in the first wave of the survey. We implemented an RCT of information treatments in the third wave (discussed in details later).

province, and their own provinces, respectively. To elicit their expectations, we ask respondents to predict the GDP growth rate in Q1 2020.[7] As supplementary indicators, we also elicit respondents' longer-term expectation on the national-level annual real GDP growth rate of 2022, and short-term expectations on the y-o-y CPI growth rates of Q1 2020 of the nation, Hubei province, and their own province, respectively. The order between the sets of GDP-expectation questions and CPI-expectation questions is randomly determined for each respondent-wave, in order to avoid potential anchoring effect. We follow the strategy of Armona, Fuster, and Zafar (2019), among others, and incentivize all the short-term expectation questions by informing respondents that they had a chance to receive additional rewards if their predictions were close enough to the officially-released data.[8]

We additionally elicit respondents' perception on the current work resumption rate at the national level.[9] Respondents also provide information on their adjustments in investment portfolios in the past week and investment plans in the next three months, and the major demographic attributes.

Appendix B provides an English version of the full list of questions from the first and third waves.[10] Each wave typically takes about 5-6 minutes. Respondents received 10 RMB (about $1.4) for completing each wave of the survey.

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[7] For example, the question on the expectation of the national-level GDP growth rate reads "*The national GDP growth rate in 1st Quarter 2020 (January-March 2020) will be _ %. (That is, how much does the GDP level rise from the end of March 2019 to the end of March 2020?)* Respondents filled their answers in the blank.

[8] Before the expectation questions, respondents were told "*Please note that there are some award-winning prediction questions, and those questions will be marked. After all three rounds of surveys, we will randomly select one question your answered form the marked questions. If the difference between your prediction and the official statistics does not exceed 0.2 percentage, we will reward you an additional 60 RMB in cash. Additional rewards will be given after all relevant statistics are released in the second quarter of this year*". They were also reminded their previous answers from the previous wave in the second and third waves of the survey.

[9] The question reads "*You think that the current national work resumption rate is approximately__. (That is, work in the office or factory, or return to the original way before the epidemic; work from home is not included.)*". Respondents filled their answers in the blank.

[10] The list of questions from the second wave is the same as the first wave without the time-invariant questions. It is available from the authors upon request.

B. RCT on Information Treatment

Aside from the number of confirmed cases, we are also interested in the impact of perceived economic activities on expectations. To study this, we can potentially focus on one of the most salient indicators of economic activity – the work resumption rate (i.e. percentage of workers back to normal working schedule compared with the same period in the previous year). However, unlike the number of confirmed cases in each city which is largely exogenous, the resumption rate is much more likely to be endogenous. To address this endogeneity concern, an RCT with information treatment is imbedded in the third wave of the survey. As described above, there are totally 1,284 respondents in this wave, and all of them participated in the RCT. The experimental setup includes the following three stages.

(1) **Baseline stage**: As described in Section II.A, we firstly elicit respondents' short- and long-term expectations on GDP and CPI growth rates, with the short-term prediction questions being incentivized. We also elicit respondents' estimate on the current national-level work resumption rate without incentive. The incentives and the elicitations are exactly the same as in the first two waves.

(2) **Information treatment stage**: Right after the baseline stage, the 1,284 respondents are randomly assigned to one of the five groups with different sets of information:

- Average work resumption rate (T0): this is our basic information treatment (baseline hereafter) in which respondents are informed about the *average* work resumption rate of 63 major Chinese cities (excluding all cities in Hubei province) on March 11th, 2020, the day before the start of the third wave. As described in Section I, this work resumption rate indicator is publicly released and updated daily by two institutes at Tsinghua University based on the mobile phone signaling data. We also provide the source of the information,

and a brief description on its methodology.[11]

- T0 + high work resumption rate (T1): in addition to the *average* work resumption rate, respondents are also informed about the *highest* work resumption rate of the 63 cities.
- T0 + low work resumption rate (T2): in addition to the *average* work resumption rate, respondents are also informed about the *lowest* work resumption rate of the 63 cities.
- T0 + major city work resumption rate (T3): in addition to the *average* work resumption rate, respondents are also informed about the work resumption rate in *Beijing*.
- T0 + home province work resumption rate (T4): in addition to the *average* work resumption rate, respondents are also informed about the work resumption rate in the *capital city of their own residing province*.

(3) **Revision stage**: This stage follows right after the treatment stage. We ask respondents in all the five groups to predict short- and long-term GDP and CPI growth rates again using the same elicitation technique. In the revision state, we also remind respondents that, the prediction accuracy rewards would be evaluated based on their answers provided in this stage, instead of the baseline stage, if they choose to answer differently. After the prediction, we also ask respondents about their perceived reliability of the work resumption

[11] The whole information shows as: "*Next, we will show you some additional information to help you predict the change in price level and GDP. Please read the following information carefully. You will answer the prediction questions again after reading. The last reward will be based on your revised forecast.*

Tsinghua Tong Heng Cheng Shi Technology and Research Institute of Information Technology of Tsinghua University applied 'Grid+Big Data+AI' technology to study the daily 'population activity level in commercial areas' of each city. The indicator reflects the ratio of the number of active populations in the top ten commercial areas that day of each city to the average number of active populations in the same area from September to November 2019. It could be roughly referred to as the resumption rate of main business areas in the city that day.

According to the statistics, as of 11 March 2020, ***the average work resumption rate*** *in main commercial areas of 63 major cities (excluding cities in Hubei Province) in China is* ***65.6%****.*"

information, and whether the information helped them revise their predictions.[12]

C. Sample Characteristics

Column (1) of Table II lists the major demographic attributes of the sample from the first wave of the survey. 50% of our respondents are male. The average age of our respondents is about 36.75 years. 65% of the respondents are married, with an average household size of 3.73 persons, including 0.92 kids. 84% of the respondents live in urban areas, and 57% of the respondents received post-high school education (i.e., 3- or 4-year college education, or graduate education). 86% of the respondents are employed, and another 7% are still college or graduate students. Although we avoid asking direct questions on respondents' income which might be sensitive, we ask respondents' monthly consumption, which is on average 2,347 RMB *per capita* in a month.

Columns (2) and (3) show the demographic attributes of the sample from the second and third waves. The average age of respondents significantly increases in these two waves, implying a higher attrition rate for the younger cohorts. Not surprisingly, the share of married respondents and the average number of kids are also higher in these two waves. The other demographic attributes of the respondents in the second and third waves are not statistically different from the first wave.

D. Data on COVID-19 Cases

Besides the data from the survey, we also collect the city-day panel of key COVID-19 indicators in the 82 cities between February 22th (i.e., 7 days before the first wave of survey) and March 13th (i.e., the last day of the third wave of survey) from the official websites of the health commissions in the seven provinces,

[12] These two questions show as "*To what extent do you think the work resumption statistics above will help you modify predictions?*" and "*Do you think the work resumption statistics above are credible?*", respectively.

including the daily numbers of newly confirmed cases, cumulative confirmed cases, and deaths.

Figure II depicts the city-level cumulative COVID-19 cases in our sample cities by March 20th, 2020. The cases highly concentrated in Hubei cities, the epicenter of the COVID-19 epidemic. Cities in Hunan and Guangdong provinces also had relatively more cases, followed by cities in Fujian and Sichuan provinces. The cities in Inner Mongolia and Liaoning provinces suffered relatively less from the epidemic. During the sample period, on average there were 2.43 new cases for each city-day; the number reached 189.70 for Wuhan, 0.58 for non-Wuhan cities in Hubei province, and was only 0.02 for the non-Hubei cities.

III. Research Design

A. Impact of COVID-19 on Economic Expectations

In the first stage, we examine the impact of COVID-19 severity on economic expectation. Using the first three waves (before the respondents revise their expectation with the information treatment in the third wave), we first document the causal impact of local COVID-19 severity on individual's expectations of GDP growth rate in Hubei, in their own province, and in China, as well as other economic indicators. The model is specified as follows:

$$(1) \quad \Delta Y_{i,j,t,t-1} = \beta \times \Delta COVID19CASE_{j,t,t-1} + \alpha_i + \gamma_t + \epsilon_{ijt}$$

where $\Delta Y_{i,j,t,t-1}$ refers to the revision on economic expectation of individual i from city j between time t-1 and time t. Specifically, if an individual expects the GDP growth rate in Q1 2020 in China to be 3% in the first wave, and revises his expectation to 4% in the second wave, then $\Delta Y_{i,j,t,t-1}$ is 4%-3%=1% (t refers to wave 2 and t-1 refers to wave 1). $\Delta COVID19CASE_{j,t,t-1}$ refers to the number of new COVID-19 cases in city j from time t-1 to time t. For each individual, we have two observations regarding their expectation revisions (revision from wave 1 to wave

2, and revision from wave 2 to wave 3), corresponding to two observations on the number of new COVID-19 cases in between wave 1 and wave 2, and wave 2 and wave 3. We pool the two observations together to form a panel at the individual level. α_i refers to individual fixed effects, and γ_t refers to date fixed effects indicating the date that individual *i* completed the survey. The standard errors are clustered at the city level because the COVID-19 severity variation is at the city level.

The identification hinges on the exogeneity of $\Delta COVID19CASE_{j,t,t-1}$ at the city level, which should be a credible assumption because the number of new cases over a range of 6-7 days is fairly unpredictable, even to the local governors. Conditional on individual fixed effects, our estimation exploits the variation on the number of new cases in between wave 1 and wave 2, and wave 2 and wave 3 on the variation of revision to economic expectations, *within* the same individual.

B. Impact of Economic Recovery on Economic Expectations

In the second stage, we adopt two strategies to investigate the impact of economic recovery perception on economic expectations. We first document the impact of respondents' perceived work resumption rate on their economic expectations with the model of:

$$(2) \qquad \Delta Y_{i,j,t,t-1} = \beta \times RESUMPTION_{i,t} + \alpha_i + \gamma_t + \epsilon_{ijt}$$

where $RESUMPTION_{i,t}$ refers to the estimate on the national-level average work resumption rate by individual *i* in time *t*; the other variables share the same definitions with Equation (1). We are interested in whether higher economic recovery perception lead to higher economic expectations.

One potential problem with Equation (2) is the perceived work resumption rate might be endogenous – for instance, a respondent might perceive a higher work resumption rate when the epidemic is better controlled in the city. In order to better distinguish the effects between COVID-19 severity and economic recovery, we

implemented a randomized controlled trial in wave 3 to understand whether information provision on the level of economic recovery would affect individual's revision on economic expectation. The econometric specification is similar to Armona, Fuster and Zafar (2019), as shown below:

(3) $$\Delta Y_{i,j,t} = \beta_0 + \beta_1 \times T_{1,i,j,t} + \beta_2 \times T_{2,i,j,t} + \beta_3 \times T_{3,i,j,t} + \beta_4 \times T_{4,i,j,t} + \beta_5 \times Perception\ Gap_{i,t} + \beta_6 \times T_{1,i,j,t} \times Perception\ Gap_{i,t} + \beta_7 \times T_{2,i,j,t} \times Perception\ Gap_{i,t} + \beta_8 \times T_{3,i,j,t} \times Perception\ Gap_{i,t} + \beta_9 \times T_{4,i,j,t} \times Perception\ Gap_{i,t} + \beta_{10} \times Perception\ Gap_{i,t} + \alpha_j + \gamma \times X_i + \epsilon_{ijt}$$

where $\Delta Y_{i,j,t}$ is the revision of GDP and CPI expectations before and after the information provision. $T_{1,i,j,t}$ to $T_{4,i,j,t}$ refers to the treatment dummy variables of the four groups of treatment. Note that both the basic info treatment (baseline) and additional info treatment groups are provided with a piece of information before they are asked to revise their predictions. The difference between baseline and other treatment groups is that the other groups are provided with additional information related to some specific cities. $Perception\ Gap_{i,t}$ refers to the gap between individual's prior on the level of economic recovery in China, and the average level of economic recovery of 63 major cities in China calculated by AI experts from Tsinghua University. For example, if an individual's prior is 60% (indicating that the current level of economic activities in China is 60% of the level in normal period), then the $Perception\ Gap_{i,t}$ equals to 65.6% (calculated by AI experts, which is provided to both the baseline and other treatment groups) – 60%=5.6%. Therefore, a larger perception gap indicates a more pessimistic perception on the economic recovery level in China during the COVID-19 epidemic.

First of all, we are interested in the significance level and magnitude of β_0, which helps us to test whether information on the work resumption rate and hence intensity of economic activity has any mean effect on respondents' expectations. In addition, β_1 to β_4 captures the mean difference in expectation revision in T1 to T4 groups relative to the baseline group.

Secondly, β_5 estimates the impact of individual's belief updating on economic expectations, we should expect that a larger perception gap leading to an upward revision of expectation on GDP growth, which means that β_5 should be positive. Thirdly, if the additional information on top of T0 can affect the relationship between perception gap and expectation revision, we would expect that the coefficients on the interaction between the treatment dummies and perception gap (i.e., β_6 to β_9) to be significant. The model also includes a set of control variables. a_j refers to city fixed effects, and X_i refers to the demographic characteristics such as gender, age, marriage, education and industry. Robust standard errors are adopted for the regression analysis because each individual only has one observation in this design. In addition, to ensure the validity of the RCT design, we test whether the observable characteristics among the five groups (one baseline group and four additional treatment group) are balanced.

IV. Impact of COVID-19 on Economic Expectation

A. Descriptive Statistics

Among the valid responses from the three waves, we trim the sample via the following three steps. First, we only keep respondents participating in all the three waves. Second, all respondents who failed to meet the criterion in the quality-check questions are dropped.[13] Third, we trim the sample by dropping the top 2.5% and bottom 2.5% of responses to each of the six short-term prediction questions (for the third wave, we trim the sample based on the before-treatment prediction from the baseline stage). For the post-treatment predictions provided in the final stage of the third wave, we choose not to drop observations with extreme predictions because

[13] Each wave of the survey included the questions of "*Did anyone you know was tested positive for coronavirus?*" and "*Did anyone you know was placed under quarantine because of the coronavirus?*", both of which allowed multiple choices. For either of the two questions, if a respondent chose both "none" and any other options, we believe the respondent did not pay enough attention to the survey and thus would drop this observation from all the three waves.

that might introduce bias. Instead, we winsorize the post-treatment predictions to minimize the sensitivity to outliers.[14] After the above steps, the working sample includes a balanced panel of 936 individuals in the three waves.

Figure III shows the distribution of economic expectation in different waves. Panel A shows the expected GDP growth rate in the first quarter of 2020. In addition to the expectation of Q1 2020, we also plot respondents' expectation on 2019 as a reference in the graph. All the predictions are y-o-y values (i.e. comparing the end of year 2019 with the end of year 2018; comparing the end of Q1 2020 with end of Q1 2019). When compared with their perception of China's GDP growth rate in 2019, our respondents substantially decrease their predictions on the GDP growth in Q1 2020 though this adjustment seems to be stable across all three waves. For example, the mean predicted GDP growth rates for the nation are 9.06%, 8.76% and 8.54% in the three waves respectively. The medians are at 5.5%, 5.5%, and 5.3% with lower and upper quartiles not changing (3.0% and 10%).[15] It is worth noting that the reported mean GDP growth rate of 2019 is 11.19% with a median value of 7%. This is close to the true value of 6.1%, especially for the median suggesting that respondents generally have a good understanding and feeling about the GDP growth rate. This also lends us confidence over the respondents reported predictions on GDP growth rate. On the contrary, the mean reported CPI growth rate of 12.21% and median of 10% in 2019 are both drastically off the actual value of 2.9%.[16]

Panel B of the same figure plots the same predictions for Hubei province that has been strike by COVID-19 the most. The patterns are similar to Panel A except that the predicted values are lower in all waves. The means are 7.89%, 7.68%, and 7.75%

[14] Specifically, we trim the top 2.5% and bottom 2.5% of the pre-treatment predictions in the third wave to determine the upper and lower limits. For the post-treatment predictions, if their values are above the upper limit or below the lower limit, we set their values to the respective limits.

[15] Specific summary statistics can be found in Table III.

[16] Both GDP and CIP growth rates of 2019 are obtained from National Bureau of Statistics of China. http://www.stats.gov.cn/

from the three different waves with the medians all being 5.0%. The comparison between the national- level prediction and prediction for Hubei province reveals that respondents do consider the severity of the epidemic situation in different parts of the country. In addition to the predictions for Q1 2020, we also elicit respondents' predictions for the 2022 GDP growth rate in China though not being incentivized. The summary statistics are plotted in Panel C of Figure III. As one would expect, survey respondents have much more optimistic predictions. The means for the three waves are at 10.48%, 10.32%, and 10.38% respectively with the medians at 7.30%, 7.00%, 7.00%. This reflects that the survey respondents are confident that the epidemic would only affect the economy in the short run.

Figure IV shows the same box plots for the predicted CPI growth rates. Panel A plots the nationwide predictions while Panel B plots the predictions for Hubei province. Similar to the GDP predictions, the predictions on CPI growth rates do not vary much across the three different waves. For the nationwide CPI growth predictions, the means are at 11.42%, 11.18%, and 11.22% for the three waves respectively. The CPI predictions are more skewed to the right with the medians being much smaller than the means at 7.20%, 6.50%, and 6.75% across the three waves. Panel B shows slightly higher numbers for the Hubei province when compared with the national-level predictions. This again suggests that respondents distinguish the more and less affected areas when making predictions. We also provide the same box plot for the predicted GDP and CPI growth rates in respondents' own provinces in Figure A.2.[17]

Because our main analysis focuses on the changes in expectations, we also plot the distribution of changes from wave 1 to wave 2 and from wave 2 to wave 3 in Figure V. Panel A shows the distribution of changes in the GDP growth rate prediction while Panel B shows the distribution of changes in the predicted CPI

[17] The box plots using unbalanced panels (i.e. keeping responses that only exist in wave 1 and wave 2) are included in Figure A.3 for readers' easy reference.

growth rate. Both panels show tighter distributions from wave 2 to wave 3 than from wave 1 to wave 2. This reflects both convergence in terms of predictions as well as the diminishing information update effect. The same plots for the Hubei province and own province outcomes have similar patterns. They are included in Figure A.4.

In terms of the cumulative number of confirmed cases, we show the city level summary statistics in Table III. The average numbers are 2,276.41, 2,307.61, and 2,312.53 for the three different waves respectively. One would expect that the city level numbers are highly skewed to the right because Wuhan and other cities in Hubei province contribute most of the newly confirmed cases during this period. This is confirmed by the median values of 72 for all the three waves.

In Table IV, we provide summary statistics of the variables we use for our regression analyses including the change in expectations on GDP growth rate, the change in expectations on CPI growth rate, the change in number of confirmed cases, as well as the subjectively perceived work resumption rate. It can be seen from the table that survey respondents generally adjust down their expectation on the economic prospect though the mean value is relatively small. For example, respondents on average reduce their predicted GDP growth rate by 0.26 percentage point from the previous wave to the current wave. Although the mean values are relatively small, the ranges of the changes are quite large. In terms of the number of newly confirmed cases, the mean value is 18.06 for the interval between the first wave and the second wave and the interval between the second wave and the third wave. This variable also has large standard deviations and a wide range owing to the large heterogeneity among different cities. Lastly, the perceived work resumption rate is about 45% across the three different waves.

B. Main Results

We first show the correlation between the number of newly confirmed cases and the change of economic expectations, which is presented in Figure VI. We divide the number of newly confirmed cases into ten ranked equal-sized bins, and scatter the mean of the outcome variable (national-level GDP or CPI growth rate in Q1 2020). Panel A shows the plot for GDP growth rate and Panel B shows the same plot for the CPI growth rate. Both panels show a negative correlation between the outcome variable and the number of newly confirm cases with Panel A being more evident.

We next proceed to the regression analysis in which we address endogeneity issues as well as control for other factors to further pin down the causal relation. Table V shows the impact of COVID-19 severity on individuals' revision on GDP growth predictions. Columns (1)-(3) report the results on different outcomes, including revision on expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020. All the three outcome variables are incentivized, and all the columns control for individual fixed effects and date fixed effects. In Panel A, the core independent variable is the number of new cases in between two waves in a city. Given that our survey was conducted after the peak of COVID-19 in China, the results clearly suggest that a lower number of new COVID-19 cases has a positive impact on GDP growth expectations. Specifically, a one standard deviation (106.88) reduction of new COVID-19 cases within the past 6-7 days would lead to an upward revision of GDP in China, in Hubei province, and in their own provinces in Q1 2020 by 0.289%, 0.128% and 0.203%, respectively.[18]

We further differentiate the impact at the extensive margin and intensive margin.

[18] We also conduct a regression analysis using absolute prediction levels instead of the revision of expectations. The result suggests that a reduction of new cases always lead to upward adjustment of the expectation on economic growth in China, Hubei, and their own provinces in Q1 2020. The results are reported in Appendix Table A.2.

By extensive margin, we refer to the impact of switching from positive number of new cases to zero. Therefore, the independent variable is a dummy variable indicating whether new cases showed up in the city since the last wave of survey (positive numbers=1, otherwise 0). By intensive margin, we refer to the decline of the number of new cases to a non-zero number, so that we drop all the observations with zero new cases since the last wave of survey. As shown in Panel B, a switch from positive number of new cases to zero causes an upward revision of GDP growth rate in Q1 2020 in China by 0.718%, which is a large magnitude relative to the average expectation (9.06% in wave 1 and 8.76% in wave 2). For the intensive margin, as shown in Panel C, we also find significantly negative coefficients on the independent variable in both cases. Overall, the results indicate that the negative impact of COVID-19 on expectation of GDP growth rate prevails at both the extensive margin and intensive margin.

Table VI shows the impact of COVID-19 severity on other economic expectations, including expectations on CPI growth rate in China, Hubei province and their own province in Q1 2020, as well as expectation on GDP growth rate in China in 2022 (not incentivized). Interestingly, we find that a reduction in the number of COVID-19 cases lead to an upward revision of expected CPI growth. Specifically, a one standard deviation (106.88) reduction of new COVID-19 cases since the last wave would lead to an upward revision of CPI in China, in Hubei province, and in their own province in Q1 2020 by 0.128%, 0.289% and 0.267%, respectively. Generally, people may believe that the food prices will rise during the epidemic period because of a reduction in supply, while non-food prices, such as housing, clothing and entertainment will fall during an epidemic because of suspension of economic activities.[19] Our findings may indicate that people believe

[19] The composition of CPI basket is not a public information. However, according to the estimation by experts from Bloomberg, food may account for 30% in the basket, while housing, clothing, service, culture and entertainment in total may account for 45% in the basket.

that the effect of the epidemic on non-food prices outweighs the effect on food prices. However, it is also possible that people are less familiar with CPI compared to GDP, so that their update on CPI expectations is correlated with their update on GDP expectations. In addition, column (4) of Table VI shows that a reduction of new COVID-19 cases would lead to an upward revision of GDP growth in 2022. The expectation question for this outcome is not incentivized though.[20]

We also conduct robustness checks to ensure the validity of the above main results. First of all, we employ a distance-weighted measure of the number of confirmed COVID-19 cases. In particular, we replace the independent variable in Panel A of Table V with the distance-weighted number of new COVID-19 cases in other cities and this result is shown in column (1) of Table VII. It can be seen that none of the coefficients is significant at any conventional level indicating that respondents only care about the number of newly confirmed cases in their own cities but not in other cities. More importantly, this result also suggests that our main result is *not* due to the common time trend during the sampling period. In column (2) of Table VII, we further add in the original regressor (i.e. number of newly confirmed cases). The result remains consistent where the original regressors have significant coefficients with the distance-weighted measures continue to be insignificant.

Secondly, we test whether the choice of fixed effects would affect our results. In Table A.5, we replicate the analyses in Table V but replacing the individual fixed effects with city fixed effects and cluster the standard error at city level correspondingly. In addition, we control for the key demographic variables. It can be seen from the estimated coefficients that the results are very similar to the ones reported in Table V. This shows that our results are robust to the choice of different levels of fixed effects.

[20] We also analyze the impact of COVID-19 new cases on the extensive margin and intensive margin for the four outcomes in Table VI. The results are reported in Appendix Table A.3.

Thirdly, in Table A.6, we use the logarithm of the number of newly confirmed cases as the independent variable. Note that the regression analysis on extensive margin cannot be done with the logarithm values. The results are again consistent with Table V except for the main Panel A column (2) which shows a positive but insignificant coefficient.[21]

Lastly, instead of trimming the top 2.5% and bottom 2.5% as outliers, we trim top 1% and bottom 1% and replicate the regression analyses in Table V. The results are reported in Table A.7. Compared with Table V, we see more positive but nonsignificant coefficients in the table. We suspect this is due to the high leverage that the outliers impose on the regression outcomes. Though the regression results at the province level change according to the different selection criteria of sample, the results on the nationwide outcome are more robust. Given these results, we, at least, are confident about the conclusions regarding the impacts at the national level. For the provincial level results, they are also largely consistent with a couple of exceptions driven by outliers that do not contradict our main results.

C. Heterogeneity by Age, Gender and Education and Province

Table VIII presents the heterogeneous impact by gender, age, education level and the severity of the COVID-19 epidemic. In column (1) of the table, we include an additional interaction term of gender (1 if male and 0 otherwise) and the change in number of confirmed cases. Both the main coefficient and the coefficient of the interaction term are significant at 5 percent level suggesting a much stronger effect for males. Although females do respond to the epidemic situation and one standard deviation of more confirmed cases lead them to adjust down expectation by 0.07 percentage point, males adjust down by 0.56 percentage point. Column (2) shows

[21] We deal with the zero numbers using inverse hyperbolic sine transformation following the equation $\log(var)=\log(var+(var^2+1)^{0.5})$.

the heterogeneity result for age using the same specification. We divide our sample using the median age into older and younger groups. Unlike the gender result, age shows no statistical significance indicating that older and younger respondents react to positive news (i.e. reduction in number of newly confirmed COVID-19 cases) in similar magnitude. Column (3) shows results for education. We again divide the sample into high and low education groups according to the education level achieved by the survey respondents. Those with 3-year college degree or higher are divided into the high education group and the rest belong to the low education group. Interestingly, respondents with more and less educations show no difference in their expectation adjustments. Lastly, we examine the heterogeneity in severity of the epidemic in column (4). On the surface, one may expect that the residents in more severely affected area respond more to the positive news, but they should actually do the opposite because the marginal effect of one less case is relatively small in the already heavily hit regions. This is consistent with the result from column (4). Hubei respondents respond much less radically than respondents from other provinces to the number of newly confirmed cases.

We perform the same heterogeneity analyses on the other two outcome variables – predicted GDP growth rates of Hubei province and the respondents' own provinces. Results are included in Table A.4. The results on gender and severity of epidemic impact heterogeneity are similar as for the predicted national level GDP growth rate. Results on age and education levels, however, show some discrepancy. In particular, young respondents and better educated respondents are more sensitive to the good news in terms of reduced number of newly confirmed cases. This observation applies to both the prediction on the GDP growth rate of Hubei province and one's own province. Although we are not exactly sure about the source of this discrepancy, we conjecture that it comes from the relevancy of the information. That is, the update on number of newly confirmed cases is in one's own residing city, is a better reorientation of the situation in one's own province

rather than the whole nation. Young respondents and more educated respondents usually have better access to the information, so they respond more.

V. Impact of Economic Recovery on Economic Expectation

In Section IV, we have shown that a lower number of new COVID-19 cases in a city leads to upward revision of GDP growth expectations among individuals in that city. In this section, we also consider the level of economic recovery in the analysis to understand whether individuals' perception of the resumption of economic activities would affect their economic expectations as well. Firstly, following Equation (2), we use individuals' perception on the work resumption rate in China on the survey date to proxy for their belief on the level of economic recovery during the epidemic and regress their revision of economic prediction on this measure, conditional on individual fixed effect. Then, we run a horserace model between COVID-19 new cases and work resumption rate to understand if people respond more to VODI-19 new cases or work resumption rate when updating their economic predictions.

As shown in Table IX, individual's perception on work resumption rate is not significantly correlated with their revision on economic expectation (conditional on individual fixed effect). Moreover, after controlling for both the number of new COVID-19 cases in a city and individuals' perception on work resumption rate, we still find that the decrease in the number of new cases significantly leads to upward revision of expectations on economic growth, while individuals' perception change on work resumption rate is not correlated with their revision on economic expectations. Overall, the findings indicate that individuals' economic expectations are significantly affected by the severity of COVID-19, but not affected by the level of economic recovery.

However, the readers may question the endogeneity of individual's perceived

work resumption rate. We address this concern using a randomized control trial with information treatments. As explained in Section II.B, we ask the individuals their prior belief on the current level of economic activities in China (measured by their perceived work resumption rate), and then provide the information on the average level of work resumption rates in 63 major cities. If individuals' revision on economic expectation is a function of their belief change on the current level of economic activities, we would expect individuals to update their expectations on GDP growth based on this exogenous perception gap.

Before showing the results on the information intervention, we conduct a balancing test to ensure that our randomization works. Specifically, we conduct joint test on individual characteristics among the five groups (one baseline group and four additional treatment groups) to make sure that the characteristics are similar across the five groups. As shown in Table X, all elicited expectations including GDP and CPI growth rates for the nation, Hubei province, and own province *before the revision* show no statistically significant difference across the five groups. The corresponding *p* values are shown in the last column of the table.[22] Note that these expectations are elicited *before* the information treatment so we should expect them to show no cross group difference. In addition to the elicited expectations, we also check the balance of demographic variables. The results are displayed in the remaining rows of Table X. All the demographic variables are balanced across groups except that the dummy variable on employment status is significant at 5 percent level. Therefore, we will control for demographic variables in one of the specifications in the main results of the information intervention.

Table XI shows the main results of the information intervention following the model in Equation (3). The dependent variables are the revisions of GDP growth rate for the whole nation, Hubei province and the respondent's own province. In

[22] The reported *p* values are from one-way ANOVA test of equality of each variable across the five groups.

columns (1), (3), and (5), we only include the treatment dummy variables and their corresponding interaction terms with the resumption rate difference. As illustrated in Section III, the difference in resumption rate is calculated by subtracting the respondents' belief from the nationwide average resumption rate. In addition to the treatment dummy variables and the corresponding interaction terms, we further control for city fixed effects and key demographic variables in columns (2), (4), and (6).

With the results from Table XI, we first examine *whether* information treatment on resumption rate has any impact on respondents' revisions. The estimated intercepts are the before and after difference of the information treatments. For columns (2), (4), and (6), none of the estimated intercepts are significant at any conventional significance level. This suggests that the information on resumption rate has no mean effect on respondents' expectations of the economic prospect. Though the regression results show no mean effect of the information treatment, there might be the possibility that respondents perceived the resumption rate to be similar as the information we provided. This alternative explanation does not stand as the mean perceived resumption rate is about 47% in the third wave which is substantially below the 66% mean resumption rate we provided.

To further test the impacts of additional information, we can examine the coefficients on the treatment dummy variables and their interaction terms. It is consistent across all other treatments that provided additional resumption rate information has no impact on expectations over the short run economic prospect. Given that the elicited expectations are incentivized, respondents would treat the information seriously if they deem it useful. Hence, we can safely conclude that they disregard the resumption rate information when they make their revisions. To save space, we have included the analyses of the information treatment on other outcome variables in Table A.8. The results are largely consistent with the ones observed from Table XI. This further confirms the observation that information on

economic activity – even it is better than the prior belief – does not help to improve the expectations on economic prospects.

One last concern over this conclusion is that respondents may not believe the information we provide. To rule out such possibility, we also ask respondents whether they believed our information. The answers show that most respondents (82.05%) trusted the information and its source provided by us. We further restricted our RCT sample to this group of respondents and replicate the regression analyses in Table XI. The results are reported in Table A.9. The results are also largely consistent with Table XI.

VI. Conclusion

In this study, we implement an incentivized longitudinal online survey on economic expectations with randomized controlled trials during the COVID-19 epidemic in China, and investigate the impacts of both the COVID-19 epidemic severity and the economic recovery conditions during the epidemic on individuals' economic expectations. The empirical results suggest that, lower number of new COVID-19 cases in a city significantly increases local individuals' expectations on GDP growth rate. In particular, a switch from positive number of new cases to zero can lead to an upward revision of national-level GDP growth rate in Q1 2020 by 0.718%, which is a large magnitude relative to the average expectation. By contrast, individuals' perception on the level of economic recovery is not correlated with their expectations on GDP growth. Moreover, individuals do not update their belief on economic expectations when randomized information on work resumption rate is provided. These findings jointly suggest that, *during* an epidemic such as the COVID-19, individuals' economic expectations are significantly affected by the severity of the epidemic, instead of the level of economic recovery.

Although our study focuses exclusively on mainland China, the findings can

convey valuable policy implications to other major economies which are now fighting against the COVID-19 pandemic. In the tradeoff between containing the coronavirus using aggressive lockdown or quarantine measures and encouraging the sustaining of normal economic activities, containing the spread of virus should be prioritized than resuming economic activities, at least from the perspective of maintaining positive economic expectation among individuals. Admittedly, our survey was implemented during a period when the number of COVID-19 cases started to gradually decline in China. It is nonetheless reasonable to expect the findings also apply to earlier stages of an epidemic, when the rapid virus spread is more likely to cause a panic within the population.

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Figures

Figure I. Daily New COVID-19 Cases and Work Resumption Rate in China

Note: This figure presents the time trend on the number of new COVID-19 cases in China, in Hubei province and non-Hubei provinces, and national level work resumption rates on a daily basis. The data of COVID-19 cases are from the official websites of the health commissions in the seven provinces. The data of work resumption rate in China are calculated by Research Institute of Information Technology and Tong Heng Urban Planning and Design Institution, Tsinghua University.

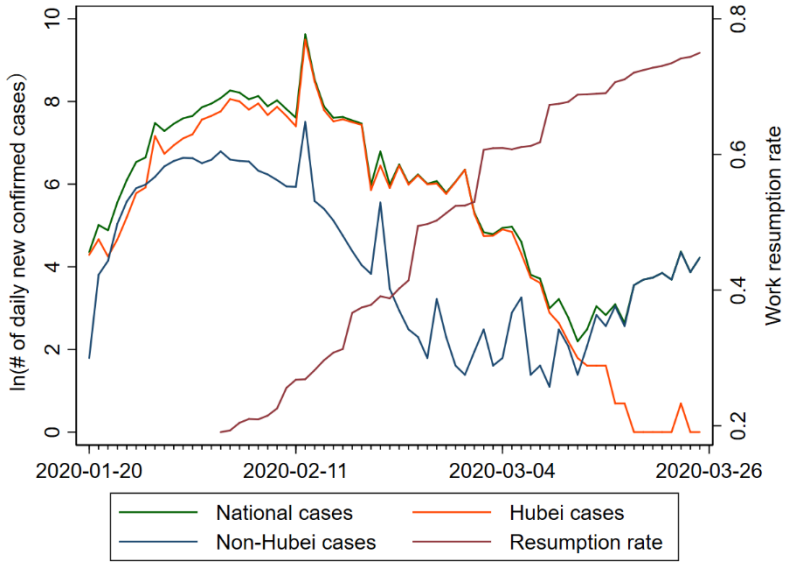


Figure II. Map of Survey Sample

Note: The map presents the geographic distribution on the cities where our respondents reside. The color scheme shows the number of cumulative COVID-19 cases in these cities by March 20th, 2020. The data on the number of cumulative cases are from the official websites of the health commissions in the seven provinces.

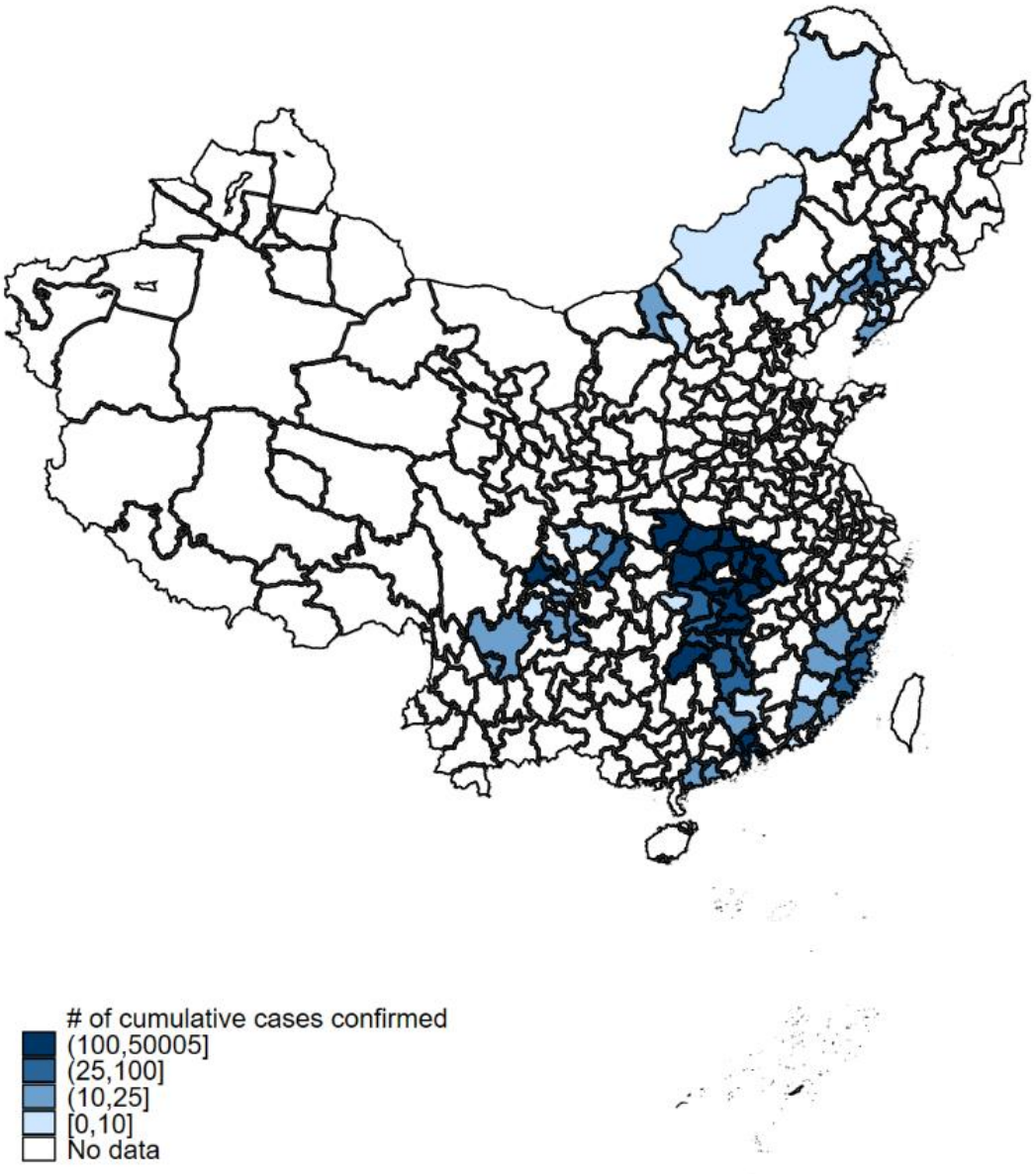
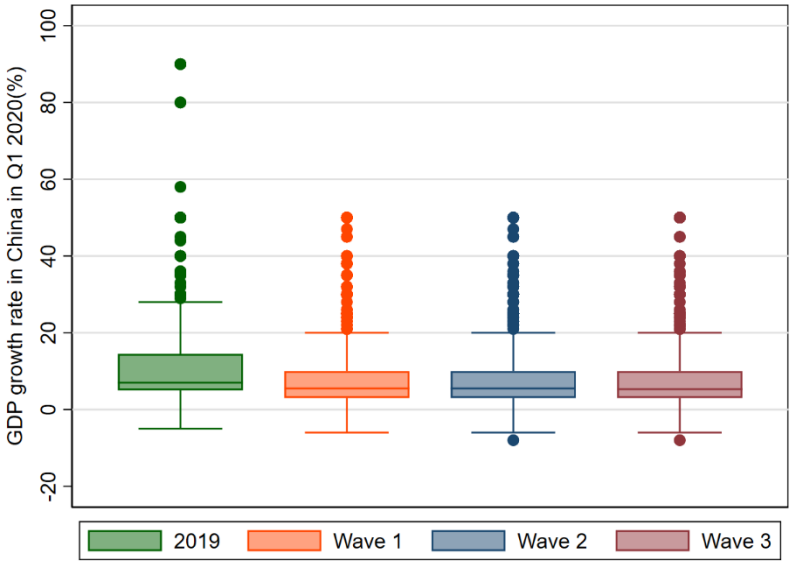
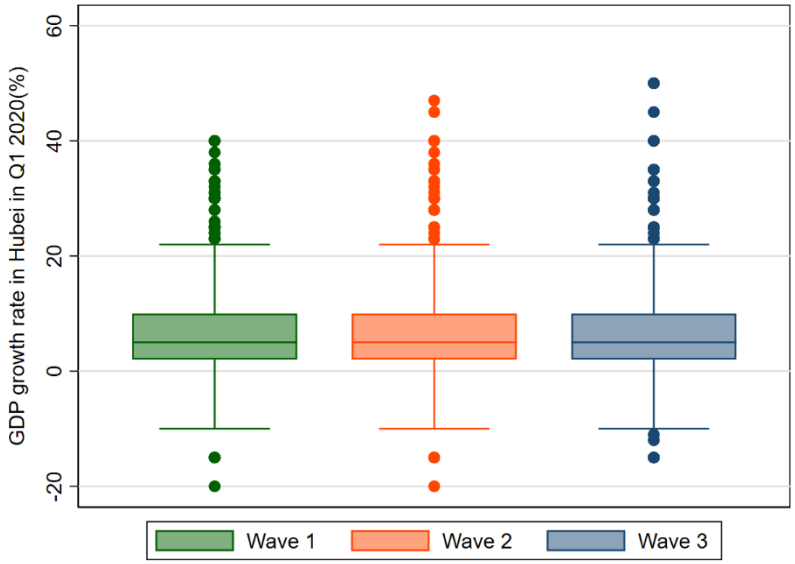


Figure III. Distribution of GDP Growth Rate Expectation

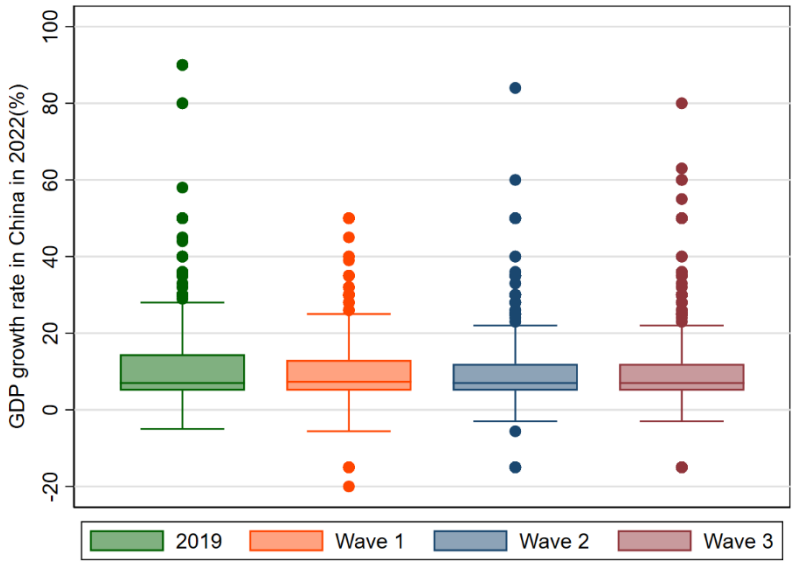
Note: The figure presents respondents' expectations on GDP growth rate in different waves. Panel A shows the box plots for the respondents' expectations on GDP growth rate in China in Q1 2020 in the three waves. In addition, their *perceived* GDP growth rate in China in 2019 (which was asked in the first wave) is also presented in the figure for comparison purpose. Panel B shows the box plots for the respondents' expectations on GDP growth rate in Hubei province in Q1 2020 in the three waves. Panel C shows the box plots for the respondents' expectations on GDP growth rate in China in 2022 in the three waves. In addition, their *perceived* GDP growth rate in China in 2019 (which was asked in the first wave) is also presented in the figure for comparison purpose.



Panel A: Predicted Q1 2020 GDP growth rate in China



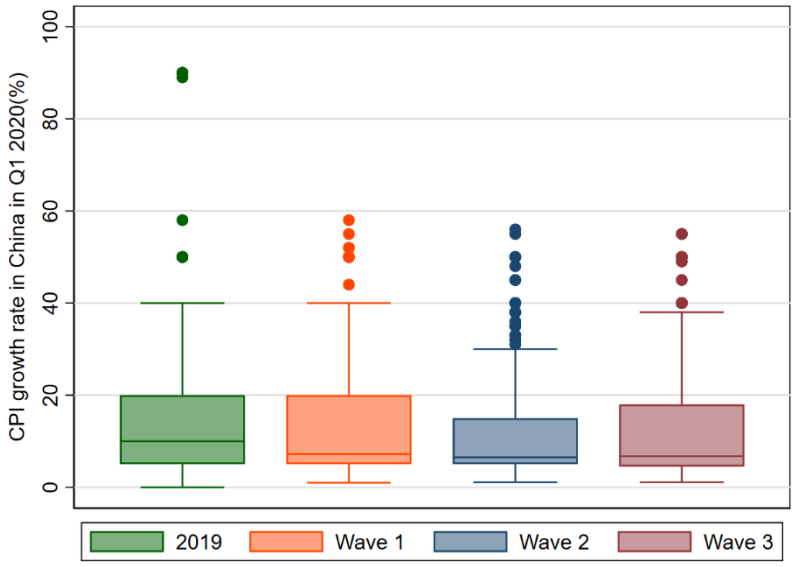
Panel B: Predicted Q1 2020 GDP growth rate in Hubei province



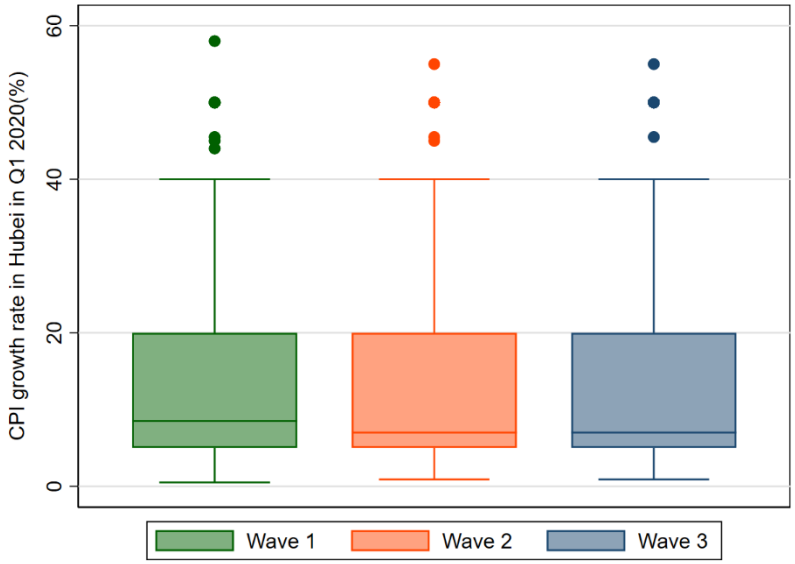
Panel C: Predicted 2022 annual GDP growth rate in China

Figure IV. Distribution of Price Level (CPI) Growth Rate Expectation

Note: The figure presents respondents' expectations on CPI growth rate in different waves. Panel A shows the box plots for the respondents' expectations on CPI growth rate in China in Q1 2020 in the three waves. In addition, their *perceived* CPI growth rate in China in 2019 (which was asked in the first wave) is also presented in the figure for comparison purpose. Panel B shows the box plots for the respondents' expectations on CPI growth rate in Hubei province in Q1 2020 in the three waves.



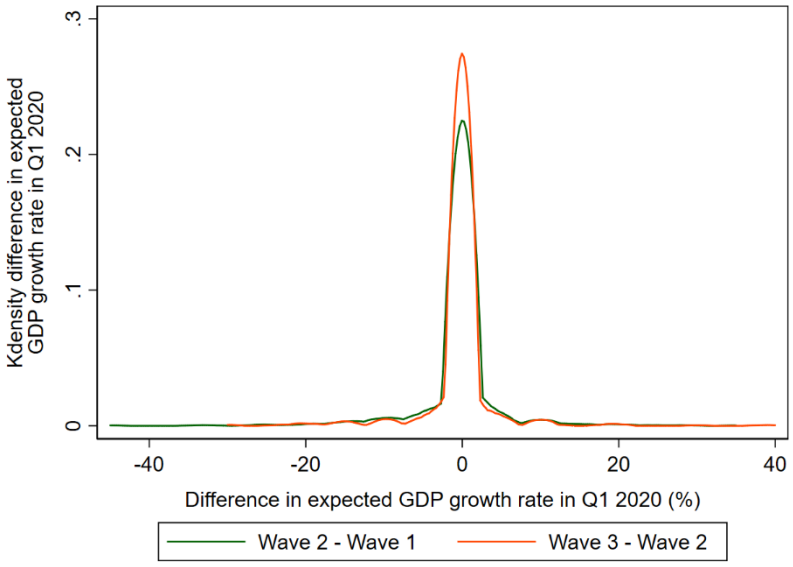
Panel A: Predicted Q1 2020 CPI growth rate in China



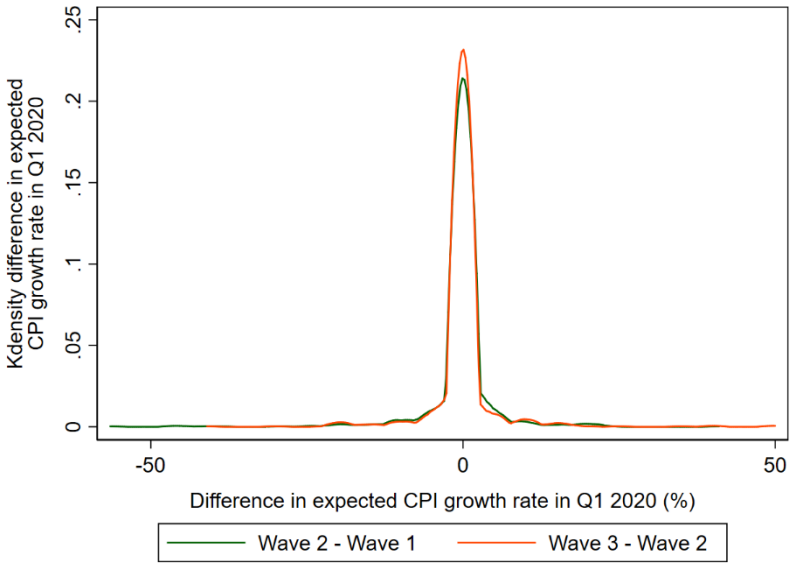
Panel B: Predicted Q1 2020 CPI growth rate in Hubei province

Figure V. Change in Prediction of GDP and CPI Growth Rates

Note: This figure presents the distribution of the respondents' revisions on economic expectations in between two waves. Panel A presents the density plot of the respondents' revisions on GDP growth rate in Q1 2020 in China. Panel B presents the density plot of the respondents' revisions on CPI growth rate in Q1 2020 in China. The kernel density plot in green shows the distribution of revision from wave 1 to wave 2, while the kernel density plot in orange shows the distribution of revision from wave 2 to wave 3.



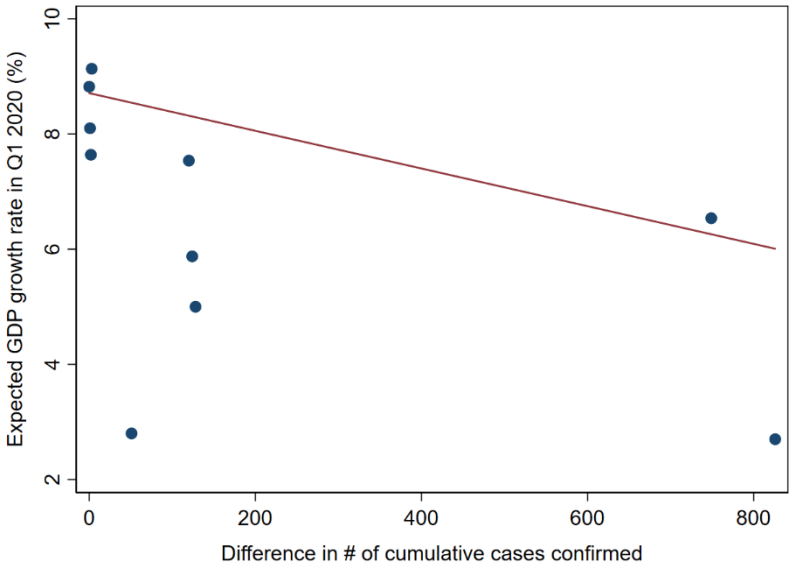
Panel A: Change in GDP growth rate prediction



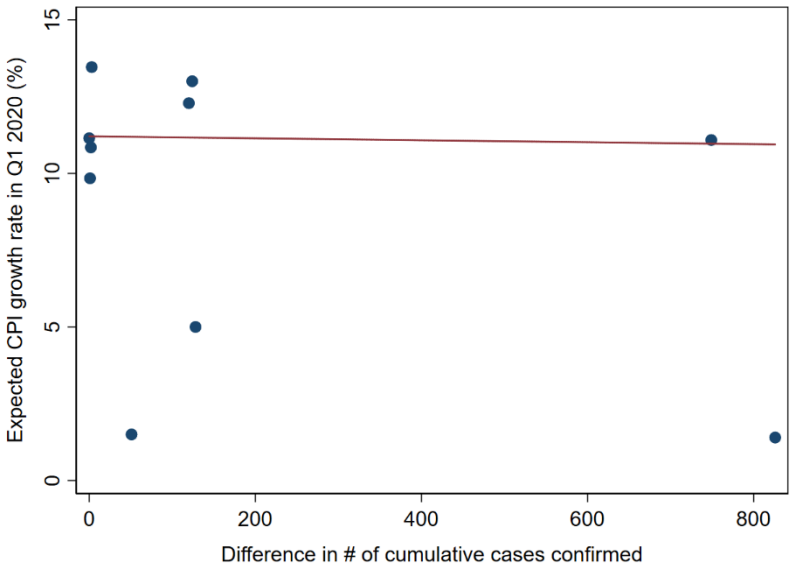
Panel B: Change in CPI growth rate prediction

Figure VI. Relationship between Economic Expectations and COVID-19

Note: This figure displays binned scatter plots corresponding to the relationship between economic expectations and COVID-19. The economic expectation is the expected GDP growth rate in China in Q1 2020 in Panel A, and the expected CPI growth rate in China in Q1 2020 in Panel B. We divide the x-*variable* into ten ranked equal-sized groups, and scatter the mean of the y-variable against the mean of the x-variable in each bin. The red line refers to the best liner estimation of conditional expected function (CEF) using OLS.



Panel A: Expectations on Q1 2020 GDP growth rate in China



Panel B: Expectations on Q1 2020 CPI growth rate in China

Tables

Table I. Sample Distributions in the Three Waves of Surveys

Note: The table presents the number of valid responses in different provinces in each wave. The percentage of the number of valid responses for each province in the full sample of each wave is presented in parentheses.

	First Wave		Second Wave		Third Wave	
Hubei	472	(24.8%)	365	(23.2%)	297	(23.1%)
Guangdong	241	(12.7%)	195	(12.4%)	149	(11.6%)
Hunan	239	(12.6%)	205	(13.0%)	165	(12.9%)
Sichuan	235	(12.3%)	193	(12.3%)	151	(11.8%)
Fujian	238	(12.5%)	194	(12.3%)	164	(12.8%)
Inner Mongolia	240	(12.6%)	203	(12.9%)	173	(11.4%)
Liaoning	240	(12.6%)	220	(14.0%)	185	(14.4%)
Total	1,905	(100.0%)	1,575	(100.0%)	1,284	(100.0%)

Table II. Major Demographic Attributes of the Sample

Note: The table presents the average and standard deviation of major demographic variables in each wave, including gender, age, *marital* status, household size, number of kids, urban residents, education level, employment status, student status and per capita monthly expenditure in the household. T-tests are performed to compare the difference between these demographic attributes in wave 2 and wave 3 to wave 1.

	First Wave	Second Wave	Third Wave
Male	0.50	0.50	0.48
	(0.50)	(0.50)	(0.50)
Age (in years)	36.75	37.75	39.48
	(11.92)	(12.09)	(11.91)
Married	0.65	0.67	0.72
	(0.48)	(0.47)	(0.45)
Household size (in persons)	3.73	3.73	3.74
	(1.60)	(1.57)	(1.57)
Number of kids (in persons)	0.92	0.96	1.02
	(0.89)	(0.89)	(0.87)
Urban residents	0.84	0.85	0.85
	(0.37)	(0.36)	(0.36)
Post high school education	0.57	0.57	0.55
	(0.49)	(0.49)	(0.50)
Employed	0.86	0.86	0.87
	(0.35)	(0.35)	(0.34)
Student	0.07	0.07	0.06
	(0.26)	(0.26)	(0.23)
Per capita expenditure (in RMB)	2346.93	2341.33	2341.59
	(7360.89)	(7512.44)	(8065.57)
N	1,905	1,575	1,284

Table III. Summary Statistics of the Core Variables

Note: This table shows the summary statistics of the core variables used in the paper, including all the expectation variables and the number of cumulative COVID-19 cases in the respondents' cities by the time of the survey. Cngdp20q1, Hbgdp20q1 and Provgdp20q1 refer to respondent's expectation on GDP growth rate in China, in Hubei and in their own resident province in Q1 2020, respectively; Cngdp2022 refers to respondent's expectation on GDP growth rate in China in 2022; Cncpi20q1, Hbcpi20q1 and Provcpi20q1 refer to respondent's expectation on CPI growth rate in China, in Hubei and in their own province in Q1 2020, respectively. GDP2019 refers to the reported GDP growth rate in 2019 and CPI 2019 indicates the reported CPI growth rate in 2019. Case refers to the number of cumulative COVID-19 cases in the respondent's city by the time of the survey. In addition, Resumption rate refers to respondent's perceived work resumption rate in China by the time of the survey, available in wave 2 and wave 3.

Wave 1	N	Mean	Sd	Min	Max	p25	p50	p75
Cngdp20q1	936	9.06	9.50	-6.00	50.00	3.00	5.50	10.00
Hbgdp20q1	936	7.89	9.08	-20.00	40.00	2.00	5.00	10.00
Provgdp20q1	936	8.27	7.86	-5.00	50.00	3.00	5.70	10.00
Cngdp2022	936	10.48	9.38	-20.00	50.00	5.00	7.30	13.00
Cncpi20q1	936	11.42	10.19	1.00	58.00	5.00	7.20	20.00
Hbcpi20q1	936	12.24	11.06	0.50	58.00	5.00	8.50	20.00
Provcpi20q1	936	11.17	9.68	0.50	50.00	4.60	8.00	16.00
GDP2019	936	11.19	10.73	-5.00	90.00	5.00	7.00	14.50
CPI2019	936	12.21	11.80	0.00	90.00	5.00	10.00	20.00
Case	936	2,276.41	9,652.19	0.00	49,122.00	19.00	72.00	417.00
Wave 2	N	Mean	Sd	Min	Max	p25	p50	p75
Cngdp20q1	936	8.76	9.09	-8.00	50.00	3.00	5.50	10.00
Hbgdp20q1	936	7.68	9.10	-20.00	47.00	2.00	5.00	10.00
Provgdp20q1	936	8.22	8.02	-10.00	58.00	3.00	5.60	10.00
Cngdp2022	936	10.32	9.51	-15.00	84.00	5.00	7.00	12.00
Cncpi20q1	936	11.18	9.92	1.10	56.00	5.00	6.50	15.00
Hbcpi20q1	936	11.84	10.78	0.90	55.00	5.00	7.00	20.00
Provcpi20q1	936	10.81	9.50	0.70	50.00	4.50	6.40	15.00

GDP2019	936	11.19	10.73	-5.00	90.00	5.00	7.00	14.50
CPI2019	936	12.21	11.80	0.00	90.00	5.00	10.00	20.00
Resumption rate	936	42.57	26.40	5.00	95.00	15.00	45.00	65.00
Case	936	2,307.61	9,800.22	0.00	49,948.00	19.00	72.00	419.00
Wave 3	N	Mean	Sd	Min	Max	p25	p50	p75
Cngdp20q1	936	8.54	9.13	-8.00	50.00	3.00	5.30	10.00
Hbgdp20q1	936	7.75	9.50	-15.00	50.00	2.00	5.00	10.00
Provgdp20q1	936	8.09	8.16	-8.00	50.00	3.00	5.50	10.00
Cngdp2022	936	10.38	9.68	-15.00	80.00	5.00	7.00	12.00
Cncpi20q1	936	11.22	10.06	1.10	55.00	4.50	6.75	18.00
Hbcpi20q1	936	11.98	10.86	0.90	55.00	5.00	7.00	20.00
Provcpi20q1	936	11.09	9.62	0.70	55.00	4.50	7.00	20.00
GDP2019	936	11.19	10.73	-5.00	90.00	5.00	7.00	14.50
CPI2019	936	12.21	11.80	0.00	90.00	5.00	10.00	20.00
Resumption rate	936	46.97	27.22	1.00	99.00	20.50	50.00	69.50
Case	936	2,312.53	9,823.64	0.00	49,999.00	19.00	72.00	420.00

Table IV. Summary Statistics of the Regression Sample

Note: This table presents the summary statistics of the regression sample, including respondent's revision on economic expectations from wave 1 to wave 2, and wave 2 to wave 3. These two revisions are pooled together to form the regression sample, along with the number of new COVID-19 cases in the respondent's city in between two waves. For example, Δcngdp20q1 refers to the revision of expectation on GDP growth rate in China in Q1 2020 from wave 1 to wave 2, and wave 2 to wave 3. Therefore, each respondent has two observations in the regression sample. Resumption rate refers to the self-perceived work resumption rate in China in wave 2 and wave 3 (not taking difference). Δcase refers to the number of new COVID-19 cases in the respondent's city in between two waves. Δcase dummy is a dummy variable that equals to 1 if Δcase is positive, otherwise 0. The sample size, average, standard deviation, and minimum and maximum are reported in the table.

	N	Mean	Sd	Min	Max
Δcngdp20q1	1,872	-0.26	4.76	-45.00	40.00
Δhbgdp20q1	1,872	-0.07	5.07	-35.00	40.00
Δprovgdp20q1	1,872	-0.09	4.62	-34.00	40.00
Δcngdp2022	1,872	-0.05	5.90	-66.00	74.00
Δcncpi20q1	1,872	-0.10	5.34	-56.50	50.00
Δhbcpi20q1	1,872	-0.13	5.28	-45.00	45.00
Δprovcpi20q1	1,872	-0.04	4.97	-37.00	50.00
Resumption rate	1,872	44.77	26.90	1.00	99.00
Δcase	1,872	18.06	106.88	0.00	826.00
Δcase dummy	1,872	0.25	0.43	0.00	1.00

Table V. Impact of Number of New COVID-19 Cases on the Revision of GDP Growth Expectation

Note: This table explores the impact of new COVID-19 cases on GDP expectation. The outcomes are the revision on expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in columns (1)-(3), respectively. The independent variable is the number of new cases in between two waves in a city in Panel A; the independent variable is dummy variable indicating whether new cases showed up in the city since the last wave of survey in Panel B; the independent variable is the same as it in Panel A but we drop all the observations with zero new cases since the last wave of survey in Panel C. For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)	(3)
Panel A	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase	-0.0027	-0.0012	-0.0019
	(0.0004)	(0.0004)	(0.0005)
Observations	1,870	1,870	1,870
R-squared	0.3972	0.3368	0.3190
Panel B. Extensive Margin	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase dummy	-0.7176	-0.0478	-0.4338
	(0.3543)	(0.5142)	(0.5049)
Observations	1,870	1,870	1,870
R-squared	0.3971	0.3366	0.3188
Panel C. Intensive Margin	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase	-0.0035	-0.0032	-0.0035
	(0.0000)	(0.0002)	(0.0002)
Observations	214	214	214
R-squared	0.4766	0.2398	0.2649
Individual FE	YES	YES	YES
Date FE	YES	YES	YES

Table VI. Impact of Number of New COVID-19 Cases on the Revision of Other Economic Expectations

Note: This table explores the impact of new COVID-19 cases on the revision of other economic expectations. The outcomes are the revision on expected CPI growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in columns (1)-(3), respectively, while the outcome in column (4) is the revision on expectation on GDP growth rate in China in 2022. The independent variable is the number of new cases in between two waves in a city. For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)	(3)	(4)
	Δcncpi20q1	Δhbcpi20q1	Δprovcpi20q1	Δcngdp2022
Δcase	-0.0012	-0.0027	-0.0025	-0.0017
	(0.0005)	(0.0003)	(0.0003)	(0.0006)
Observations	1,870	1,870	1,870	1,870
R-squared	0.3827	0.4317	0.4038	0.2834
Individual FE	YES	YES	YES	YES
Date FE	YES	YES	YES	YES

Table VII. Robustness Check: Impact of Number of New COVID-19 Cases in Other Cities on the Revision of GDP Growth Expectation

Note: This table explores the impact of new distance-weighted COVID-19 cases in other cities and new COVID-19 cases in the resident's own city on GDP expectation. The outcomes are the revision on expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in Panel A, B, and C, respectively. The independent variable is the distance-weighted COVID-19 new cases in other prefecture cities in the nation in column (1), while we further include the number of new cases in between two waves in the respondent's own city in column (2). For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)
Panel A	Δcngdp20q1	Δcngdp20q1
Δweighted case	-0.0709	-0.0972
	(0.1317)	(0.1324)
Δcase		-0.0032
		(0.0006)
Observations	1,862	1,862
R-squared	0.3964	0.3981
Panel B	Δhbgdp20q1	Δhbgdp20q1
Δweighted case	0.1066	0.1007
	(0.0923)	(0.0962)
Δcase		-0.0007
		(0.0007)
Observations	1,862	1,862
R-squared	0.3375	0.3376
Panel C	Δprovgdp20q1	Δprovgdp20q1
Δweighted case	0.0694	0.0558
	(0.1000)	(0.1031)
Δcase		-0.0016
		(0.0007)
Observations	1,862	1,862
R-squared	0.3188	0.3193
Individual FE	YES	YES
Date FE	YES	YES

Table VIII. Heterogeneous Impact of New COVID-19 Cases on the Revision of GDP Growth Expectation

Note: This table explores the heterogeneous impact of new COVID-19 cases on GDP expectation. The outcomes are the revision on expected GDP growth rate in China in Q1 2020. The independent variable is the number of new cases in between two waves in a city. *Male* refers to the respondents' gender (1=male; 0=female). *Old* equals 1 if the respondent's age is older than 41 and 0 otherwise. *Edu* equals 1 if the respondent received post high school education and 0 otherwise. *Hubei* refers to the respondent's location (1=Hubei Province; 0 otherwise). For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)	(3)	(4)
Attribute	Male	Old	Edu	Hubei
Panel A	Δcngdp20q1	Δcngdp20q1	Δcngdp20q1	Δcngdp20q1
Δcase	-0.0007	-0.0028	-0.0027	-0.3698
	(0.0004)	(0.0004)	(0.0004)	(0.4481)
Δcase × Attribute	-0.0045	0.0001	-0.0001	0.3670
	(0.0002)	(0.0003)	(0.0002)	(0.4480)
Observations	1,870	1,870	1,870	1,870
R-squared	0.3981	0.3972	0.3972	0.3975
Individual FE	YES	YES	YES	YES
Date FE	YES	YES	YES	YES

Table IX. Horserace Model between New COVID-19 Cases and Work Resumption Rate

Note: This table explores the impact of new COVID-19 cases and self-perceived work resumption rate on GDP expectation. The outcomes are the revision on expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in Panel A, B, and C, respectively. The independent variable is the resumption rate in column (1), while we further include the number of new cases in between two waves in a city in column (2). For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)
Panel A	Δcngdp20q1	Δcngdp20q1
Resumption rate	0.0057	0.0049
	(0.0123)	(0.0123)
Δcase		-0.0027
		(0.0004)
Observations	1,870	1,870
R-squared	0.3961	0.3973
Panel B	Δhbgdp20q1	Δhbgdp20q1
Resumption rate	-0.0201	-0.0205
	(0.0139)	(0.0139)
Δcase		-0.0013
		(0.0004)
Observations	1,870	1,870
R-squared	0.3380	0.3382
Panel C	Δprovgdp20q1	Δprovgdp20q1
Resumption rate	-0.0043	-0.0049
	(0.0186)	(0.0185)
Δcase		-0.0019
		(0.0004)
Observations	1,870	1,870
R-squared	0.3184	0.3191
Individual FE	YES	YES
Date FE	YES	YES

Table X. Balancing Check of RCT Randomization

Note: This table reports the balancing test of RCT groups. Columns (1)-(6) report the means of each variables in the full sample or each subsample. The sample contains the third wave of survey. The P-values from one-way ANOVA test of equality of each variable across the five groups are shown in column (7).

	(1) Full	(2) T0	(3) T1	(4) T2	(5) T3	(6) T4	(7) P-value
Obs	936	194	189	174	187	192	-
Cngdp20q1	8.54	8.90	9.10	8.24	8.11	8.40	0.80
Hbgdp20q1	7.75	8.34	8.37	7.41	6.98	7.68	0.57
Provgdp20q1	8.09	8.62	8.72	7.39	7.40	8.35	0.31
Cncpi20q1	11.22	11.14	11.83	10.59	11.28	11.33	0.84
Hbcpi20q1	11.98	12.37	12.45	10.84	12.60	11.67	0.49
Provcpi20q1	11.09	11.45	11.26	10.39	11.38	10.98	0.82
Male	0.46	0.42	0.42	0.50	0.43	0.52	0.12
Age	40.83	41.38	40.44	39.96	41.03	41.29	0.74
Married	0.76	0.75	0.75	0.77	0.76	0.76	0.99
Household size	3.79	3.94	3.59	3.77	3.92	3.70	0.14
Number of kids	1.04	1.11	0.96	1.05	1.04	1.03	0.54
Urban	0.84	0.82	0.86	0.88	0.85	0.81	0.35
Post high school education	0.54	0.48	0.56	0.58	0.49	0.58	0.11
Employed	0.87	0.82	0.83	0.88	0.87	0.92	0.02
Student	0.04	0.06	0.07	0.04	0.02	0.03	0.10
Inner Mongolia	0.15	0.14	0.13	0.13	0.20	0.13	0.28
Sichuan	0.12	0.16	0.11	0.14	0.08	0.10	0.13
Guangdong	0.12	0.13	0.13	0.11	0.10	0.13	0.78
Hubei	0.23	0.21	0.21	0.23	0.27	0.23	0.71
Hunan	0.12	0.10	0.15	0.11	0.10	0.13	0.54
Fujian	0.12	0.11	0.10	0.12	0.13	0.15	0.63
Liaoning	0.15	0.15	0.16	0.16	0.13	0.14	0.93

Table XI. Impact of Work Resumption Rate on GDP Expectation Based on RCT

Note: This table explores the impact of economic recovery perception on GDP expectations following Equation (3). The sample contains the third wave of survey. The outcomes are the revision on expected GDP growth rate in China (columns (1) and (2)), in Hubei province (columns (3) and (4)), and in their own resident province (columns (5) and (6)) in Q1 2020. For each specification in columns (1), (3) and (5), there is no control variable. For each specification in columns (2), (4), and (6), we control for city fixed effects and demographics characteristics, including gender, age, marriage, education and industry. The standard errors are clustered at the city level.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Δcngdp20q1	Δcngdp20q1	Δhbgdp20q1	Δhbgdp20q1	Δprovgdp20q1	Δprovgdp20q1
T1 (highest city)	-0.8237	-0.6091	-0.2017	0.4210	-0.6705	-0.2029
	(0.3918)	(0.4764)	(0.5586)	(0.4906)	(0.5577)	(0.5695)
T2 (lowest city)	-0.3159	-0.3816	-0.0977	0.3479	-0.0004	0.3486
	(0.7278)	(0.7146)	(0.6263)	(0.5625)	(0.6571)	(0.5716)
T3 (Beijing)	0.7701	1.0088	0.9651	1.4523	0.1640	0.6585
	(0.7799)	(0.7369)	(0.6971)	(0.5277)	(0.7264)	(0.5286)
T4 (Provincial capital)	-0.6984	-0.6742	0.1599	0.3936	-0.7639	-0.4116
	(0.5679)	(0.6190)	(0.5212)	(0.4696)	(0.4701)	(0.4463)
Δresumption rate	-0.0044	-0.0027	-0.0033	0.0059	-0.0200	-0.0123
	(0.0218)	(0.0219)	(0.0169)	(0.0154)	(0.0154)	(0.0139)
T1 × Δresumption rate	0.0027	-0.0019	-0.0006	-0.0150	0.0194	0.0123
	(0.0294)	(0.0285)	(0.0220)	(0.0202)	(0.0199)	(0.0206)
T2 × Δresumption rate	-0.0078	-0.0062	0.0139	0.0031	0.0151	0.0091
	(0.0299)	(0.0323)	(0.0193)	(0.0199)	(0.0153)	(0.0166)
T3 × Δresumption rate	-0.0129	-0.0149	-0.0167	-0.0263	0.0172	0.0075
	(0.0314)	(0.0318)	(0.0248)	(0.0250)	(0.0220)	(0.0247)
T4 × Δresumption rate	0.0344	0.0368	0.0201	0.0219	0.0426	0.0435
	(0.0288)	(0.0317)	(0.0231)	(0.0241)	(0.0223)	(0.0241)
Constant	0.3822	0.9106	0.1012	0.2328	0.7631	0.9799

	(0.3209)	(2.2438)	(0.3923)	(1.6601)	(0.3822)	(2.0269)
Observations	936	922	936	922	936	922
R-squared	0.0093	0.0856	0.0065	0.0929	0.0060	0.0899
City FE	NO	YES	NO	YES	NO	YES
Demographics	NO	YES	NO	YES	NO	YES

For Online Publication

Appendix A: Additional Figures and Tables

Figure A.1. Screenshot of Survey Environment

Note: This screenshot shows the survey environment on a smartphone. The left panel shows a multiple-choice question on perceived work resumption rate in China; the middle panel shows one of the expectation questions; and the right panel shows a question on investment behavior. The language is Chinese.

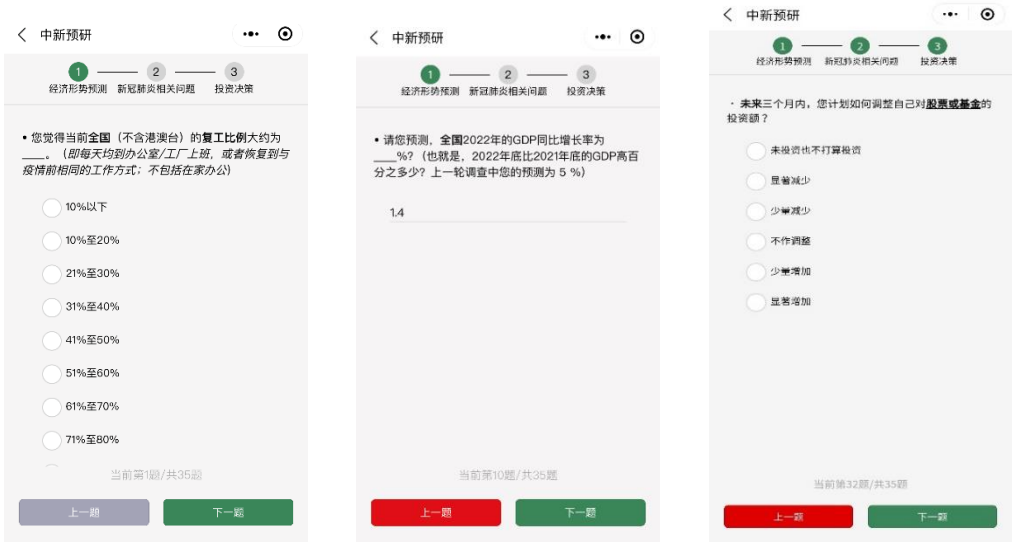
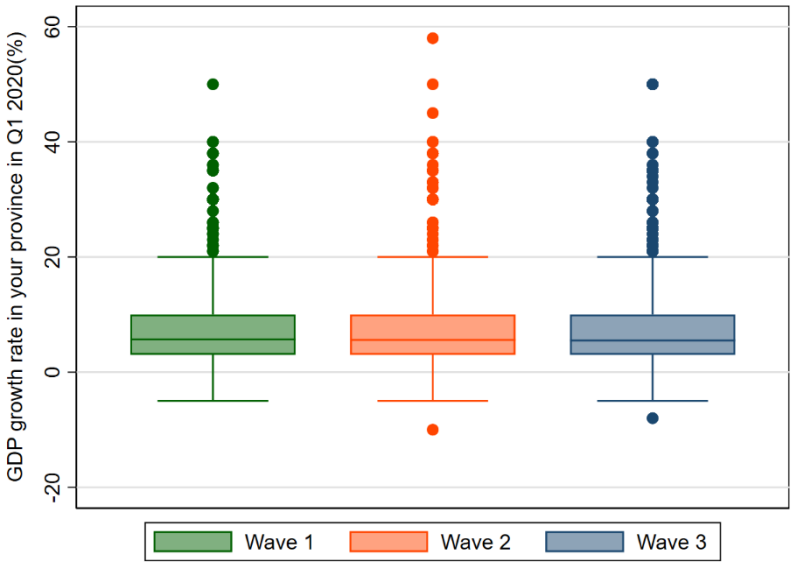
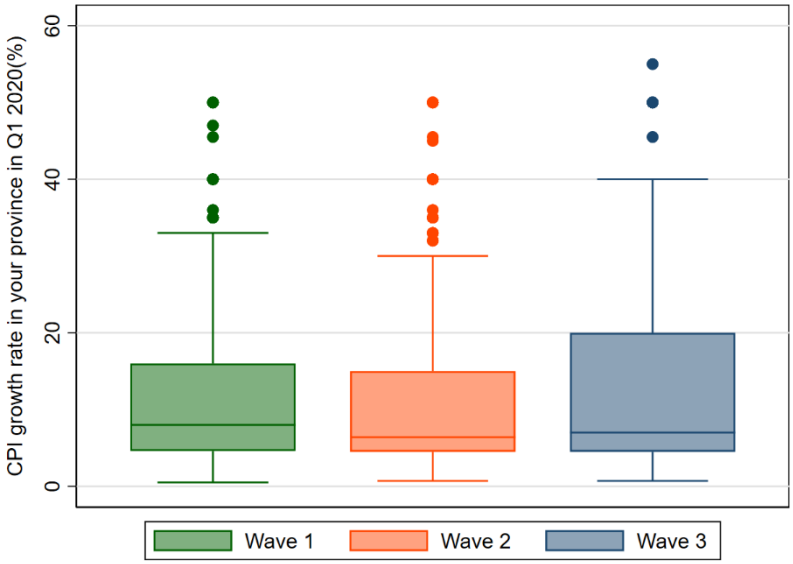


Figure A.2. Distribution of GDP and CPI Growth Rate Expectations in Resident Province

Note: The figure presents respondents' expectations on GDP and CPI growth rate in different waves. Panel A shows the box plots for the respondents' expectations on GDP growth rate in their own resident province in Q1 2020 in the three waves. Panel B shows the box plots for the respondents' expectations on CPI growth rate in their own resident province in Q1 2020 in the three waves.



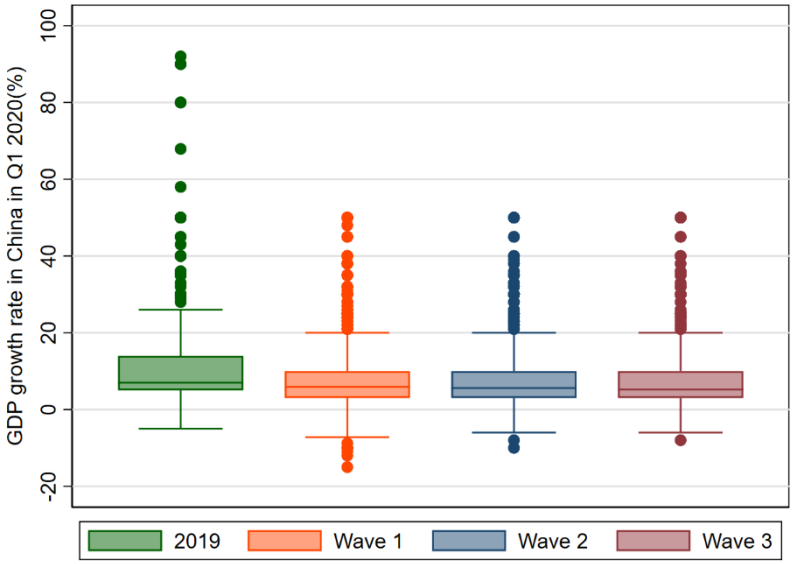
Panel A. Predicted Q1 2020 GDP growth rate in their own resident province



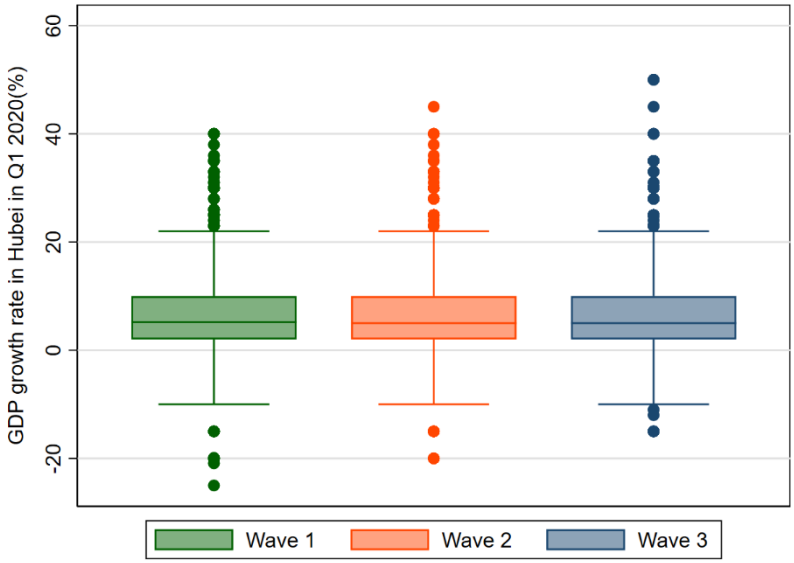
Panel B. Predicted Q1 2020 CPI growth rate in their own resident province

Figure A.3. Distribution of Economic Expectations using Unbalanced Panel

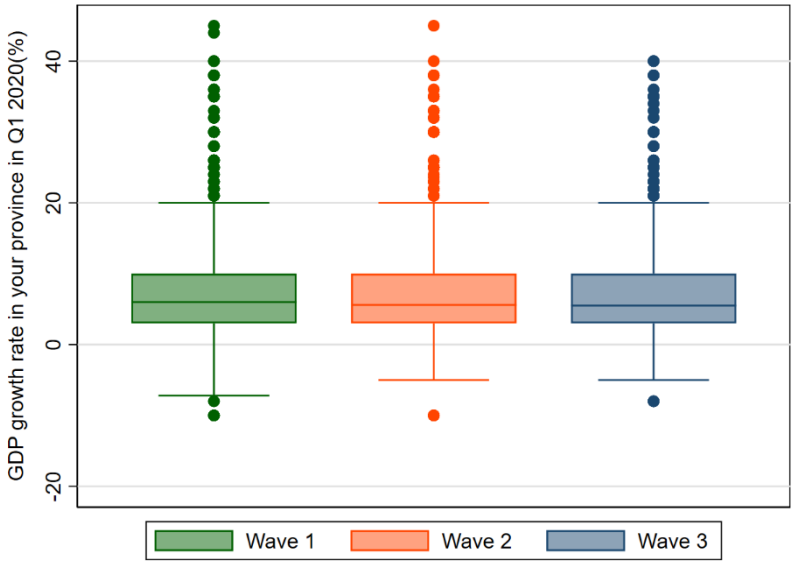
Note: The figure presents respondents' expectations on GDP and CPI growth rate in different waves using unbalanced panel. Panel A shows the box plots for the respondents' expectations on GDP growth rate in China in Q1 2020 in the three waves. Panel B shows the box plots for the respondents' expectations on GDP growth rate in Hubei province in Q1 2020 in the three waves. Panel C shows the box plots for the respondents' expectations on GDP growth rate in their own resident province in Q1 2020 in the three waves. Panel D shows the box plots for the respondents' expectations on GDP growth rate in China in 2022 in the three waves. Panel E shows the box plots for the respondents' expectations on CPI growth rate in China in Q1 2020 in the three waves. Panel F shows the box plots for the respondents' expectations on CPI growth rate in Hubei province in Q1 2020 in the three waves. Panel G shows the box plots for the respondents' expectations on CPI growth rate in their own resident province in Q1 2020 in the three waves. In addition, their perceived GDP growth rate in China in 2019 (which was asked in the first wave) is also presented in Panel A and D, while their perceived CPI growth rate in China in 2019 (which was asked in the first wave) is also presented in Panel E for comparison purpose.



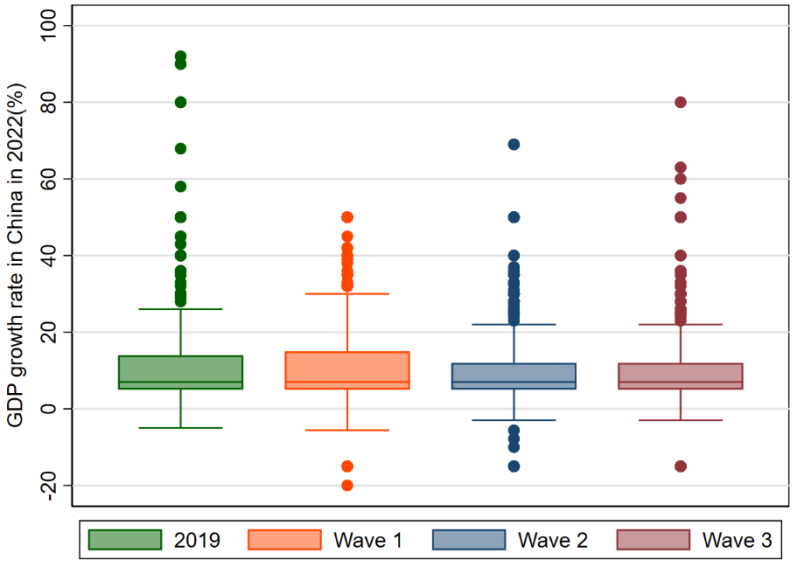
Panel A: Predicted Q1 2020 GDP growth rate in China



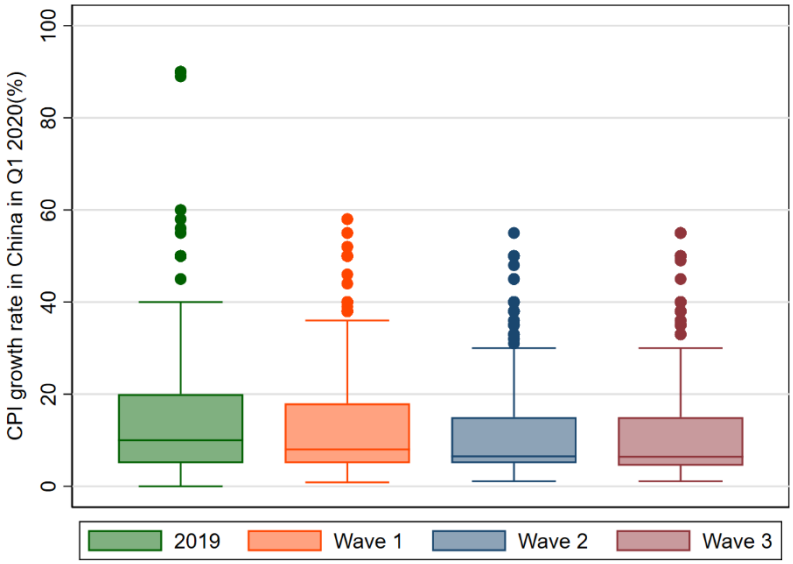
Panel B: Predicted Q1 2020 GDP growth rate in Hubei province



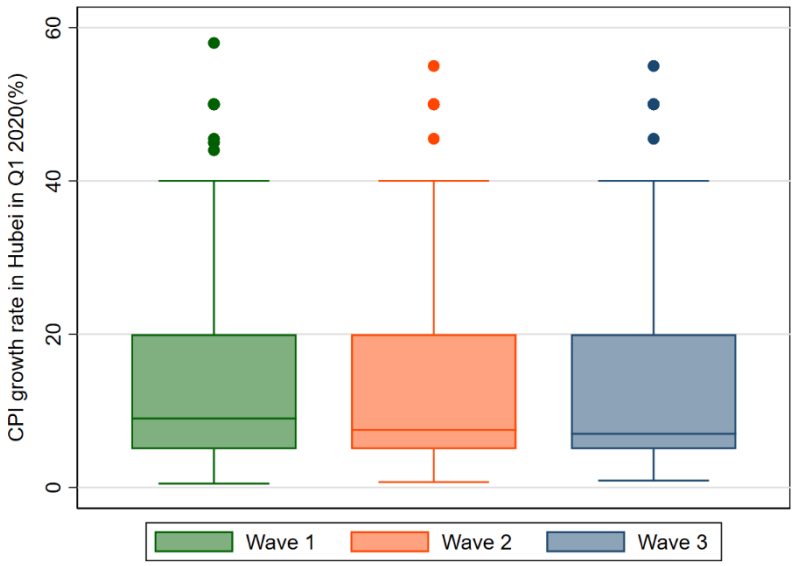
Panel C. Predicted Q1 2020 GDP growth rate in their own resident province



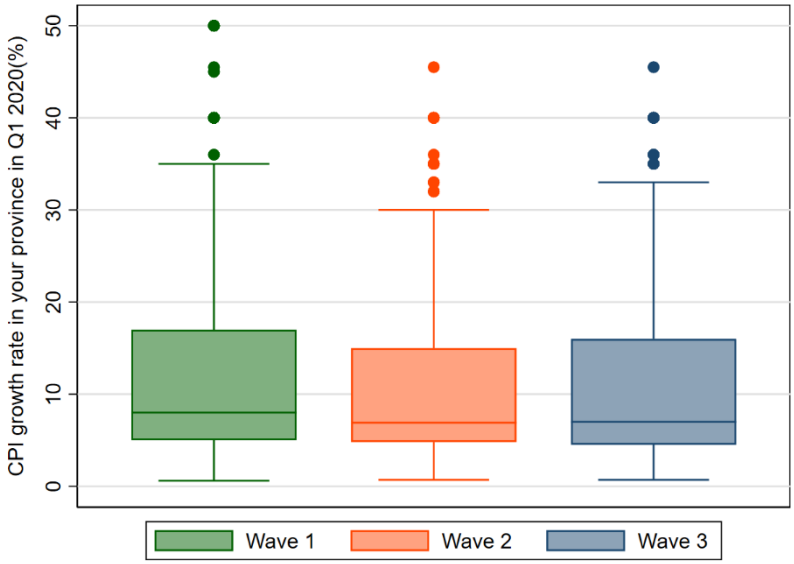
Panel D: Predicted 2022 annual GDP growth rate in China



Panel E: Predicted Q1 2020 CPI growth rate in China



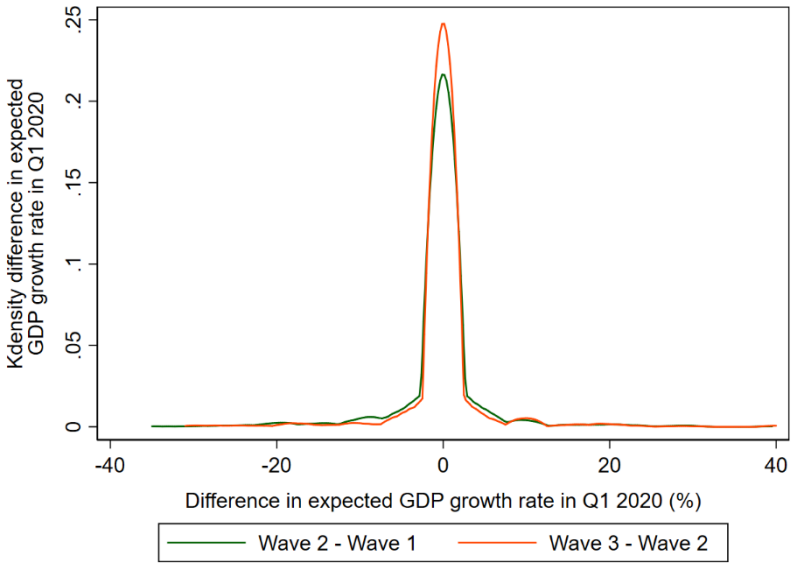
Panel F: Predicted Q1 2020 CPI growth rate in Hubei province



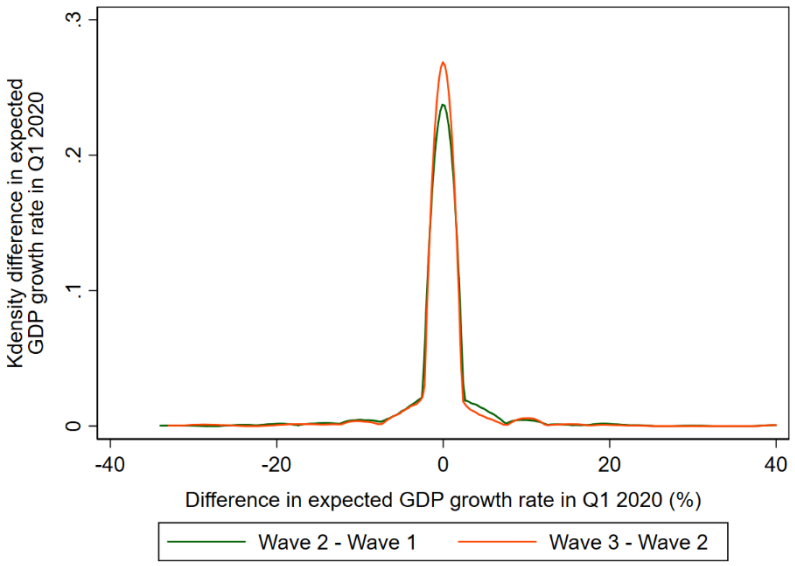
Panel G. Predicted Q1 2020 GDP growth rate in their own resident province

Figure A.4. Change in Prediction of Other Economic Indicators

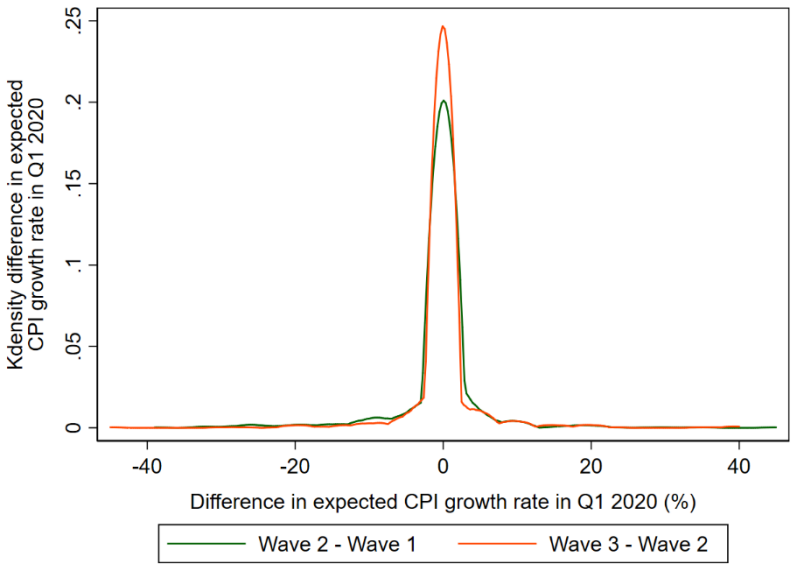
Note: This figure presents the distribution of the respondents' revisions on other economic expectations in between two waves. Panel A presents the density plot of the respondents' revisions on GDP growth rate in Q1 2020 in Hubei province. Panel B presents the density plot of the respondents' revisions on GDP growth rate in Q1 2020 in their own resident province. Panel C presents the density plot of the respondents' revisions on CPI growth rate in Q1 2020 in Hubei province. Panel D presents the density plot of the respondents' revisions on CPI growth rate in Q1 2020 in their own resident province. Panel E presents the density plot of the respondents' revisions on GDP growth rate in 2022 in China. The kernel density plot in green shows the distribution of revision from wave 1 to wave 2, while the kernel density plot in orange shows the distribution of revision from wave 2 to wave 3.



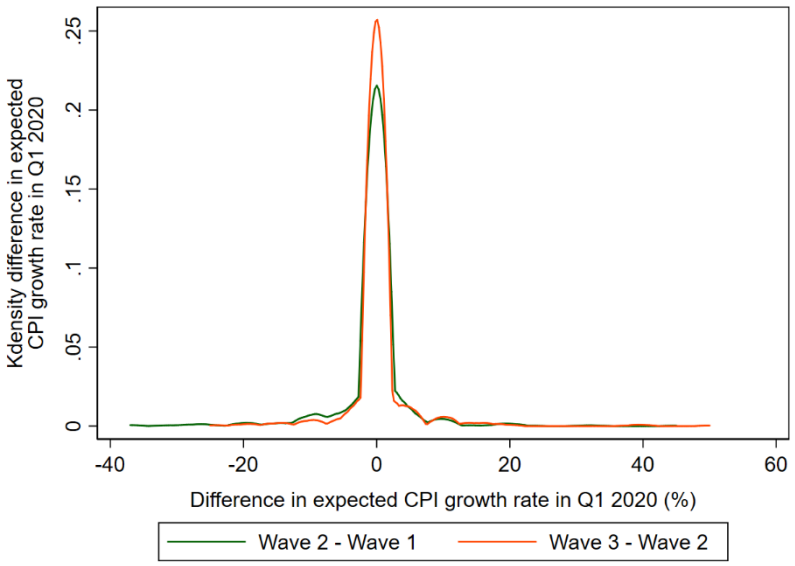
Panel A: Change in Q1 2020 GDP growth rate predictions in Hubei province



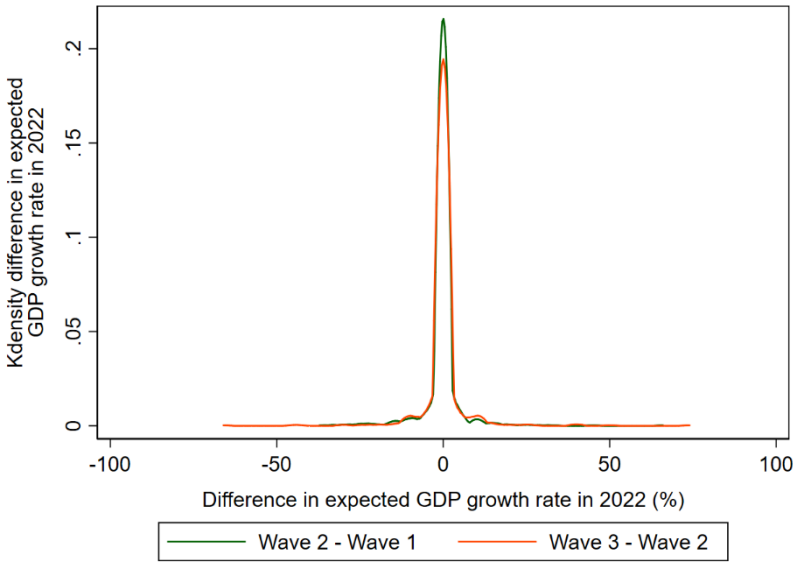
Panel B: Change in Q1 2020 GDP growth rate predictions in their own resident province



Panel C: Change in Q1 2020 CPI growth rate predictions in Hubei province



Panel D: Change in Q1 2020 CPI growth rate predictions in their own resident province



Panel E: Change in 2022 yearly GDP growth rate predictions in China

Table A.1. Survey Quota Specification

Note: This table presents the quota specification for the first wave of survey.

	Province	Target Sample	Gender Quota	Age Quota
Epicenter	Hubei	500	Within each province, male : female = 1:1	Within each province, age 20-35 : age 36-50 : age 51-60 = 4 : 4 : 2
High exposure to COVID-19	Guangdong	250		
	Hunan	250		
Medium exposure to COVID-19	Fujian	250		
	Sichuan	250		
Low exposure to COVID-19	Liaoning	250		
	Inner Mongolia	250		

Table A.2. Impact of New COVID-19 Cases on GDP Expectation

Note: This table explores the impact of new COVID-19 cases on GDP expectations. The outcomes are the expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in columns (1)-(3), respectively. The independent variable is the number of new cases in between two waves in a city. For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1) cngdp20q1	(2) hbgdp20q1	(3) provgdp20q1
Δcase	-0.0014	-0.0009	-0.0014
	(0.0002)	(0.0003)	(0.0003)
Observations	1,870	1,870	1,870
R-squared	0.9424	0.9320	0.9255
Individual FE	YES	YES	YES
Date FE	YES	YES	YES

Table A.3. Impact of New COVID-19 Cases on the Revision of Other Economic Expectations by Extensive and Intensive Margin

Note: This table explores the impact of new COVID-19 cases on CPI expectations by extensive and intensive margin. The outcomes are the revision on expected CPI growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in columns (1)-(3), respectively, while the outcome is the revision on expectation on GDP growth rate in China in 2022 in column (4). The independent variable is dummy variable indicating whether new cases showed up in the city since the last wave of survey in Panel A; the independent variable is the number of new cases in between two waves in a city but we drop all the observations with zero new cases since the last wave of survey in Panel B. For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)	(3)	(4)
Panel A. Extensive Margin	Δcncpi20q1	Δhbcpi20q1	Δprovcpi20q1	Δcngdp2022
Δcase dummy	-0.6881	-0.3313	-0.2713	-2.2764
	(0.3487)	(0.3226)	(0.2748)	(0.5953)
Observations	1,870	1,870	1,870	1,870
R-squared	0.3833	0.4309	0.4029	0.2906
Panel B. Intensive Margin	Δcncpi20q1	Δhbcpi20q1	Δprovcpi20q1	Δcngdp2022
Δcase	-0.0033	-0.0037	-0.0037	-0.0027
	(0.0001)	(0.0002)	(0.0002)	(0.0000)
Observations	214	214	214	214
R-squared	0.6840	0.3850	0.5161	0.3600
Individual FE	YES	YES	YES	YES
Date FE	YES	YES	YES	YES

Table A.4. Heterogeneous Impact of New COVID-19 Cases on the Revision of Other Economic Expectations

Note: This table explores the heterogeneous impact of new COVID-19 cases on other GDP expectation. The outcomes are the revision on expected GDP growth rate in Hubei province (Panel A), and in their own resident province (Panel B) in Q1 2020. The independent variable is the number of new cases in between two waves in a city. *Male* refers to the respondent's gender (1=male; 0=female). *Old* equals 1 if the respondent's age is older than 41 and 0 otherwise. *Edu* equals 1 if the respondent received post high school education and 0 otherwise. *Hubei* refers to the respondent's location. *Hubei* refers to the respondents' location (1=Hubei Province; 0 otherwise). For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)	(3)	(4)
Attribute	Male	Old	Edu	Hubei
Panel A	Δhbgdp20q1	Δhbgdp20q1	Δhbgdp20q1	Δhbgdp20q1
Δcase	-0.0003	-0.0023	-0.0005	-0.1746
	(0.0005)	(0.0005)	(0.0004)	(0.7181)
Δcase × Attribute	-0.0021	0.0024	-0.0016	0.1734
	(0.0004)	(0.0005)	(0.0003)	(0.7180)
Observations	1,870	1,870	1,870	1,870
R-squared	0.3370	0.3371	0.3369	0.3369
Panel B	Δprovgdp20q1	Δprovgdp20q1	Δprovgdp20q1	Δprovgdp20q1
Δcase	-0.0010	-0.0031	-0.0012	-0.3042
	(0.0005)	(0.0005)	(0.0005)	(0.8049)
Δcase × Attribute	-0.0019	0.0026	-0.0016	0.3023
	(0.0004)	(0.0004)	(0.0002)	(0.8048)
Observations	1,870	1,870	1,870	1,870
R-squared	0.3192	0.3193	0.3191	0.3192
Individual FE	YES	YES	YES	YES
Date FE	YES	YES	YES	YES

Table A.5. Robustness Check: Alternative Specification

Note: This table explores the impact of new COVID-19 cases on GDP expectation using another specification. The outcomes are the revision on expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in columns (1)-(3), respectively. The independent variable is the number of new cases in between two waves in a city in Panel A; the independent variable is dummy variable indicating whether new cases showed up in the city since the last wave of survey in Panel B; the independent variable is the same as it in Panel A but we drop all the observations with zero new cases since the last wave of survey in Panel C. For each specification, we control for city fixed effects, date fixed effects, and demographics characteristics, including gender, age, marriage, education and industry .The standard errors are clustered at the city level.

	(1)	(2)	(3)
Panel A	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase	-0.0029	-0.0014	-0.0021
	(0.0003)	(0.0004)	(0.0005)
Observations	1,871	1,871	1,871
R-squared	0.0383	0.0355	0.0339
Panel B. Extensive Margin	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase_d	-0.7154	-0.0479	-0.4330
	(0.3589)	(0.5020)	(0.4968)
Observations	1,871	1,871	1,871
R-squared	0.0381	0.0352	0.0336
Panel C. Intensive Margin	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase	-0.0035	-0.0034	-0.0035
	(0.0001)	(0.0001)	(0.0001)
Observations	461	461	461
R-squared	0.0283	0.0308	0.0289
City FE	YES	YES	YES
Date FE	YES	YES	YES
Demographics	YES	YES	YES

Table A.6. Robustness Check: Using Independent Variable in Natural Log

Note: This table explores the impact of new COVID-19 cases on GDP expectation using independent variable in natural log. The outcomes are the revision on expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in columns (1)-(3), respectively. The independent variable is the number of new cases (in natural log) in between two waves in a city. We drop all the observations with zero new cases since the last wave of survey in Panel B. For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)	(3)
Panel A	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
ln(Δcase)	-0.5928	0.1262	-0.1621
	(0.2132)	(0.2640)	(0.2942)
Observations	1,870	1,870	1,870
R-squared	0.3980	0.3367	0.3185
Panel B. Intensive Margin	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
ln(Δcase)	-1.5855	-1.3801	-1.3871
	(0.0705)	(0.0506)	(0.1644)
Observations	214	214	214
R-squared	0.4740	0.2371	0.2597
Individual FE	YES	YES	YES
Date FE	YES	YES	YES

Table A.7. Robustness Check: Using Different Outlier Cutoff

Note: This table explores the impact of new COVID-19 cases on GDP expectation under another sample cleaning procedure. Specifically, we trimmed the sample by dropping the top 1% and bottom 1% of responses to each of the six short-term expectation questions. The outcomes are the revision on expected GDP growth rate in China, in Hubei province, and in their own resident province in Q1 2020 in columns (1)-(3), respectively. The independent variable is the number of new cases in between two waves in a city in Panel A; the independent variable is dummy variable indicating whether new cases showed up in the city since the last wave of survey in Panel B; the independent variable is the same as it in Panel A but we drop all the observations with zero new cases since the last wave of survey in Panel C. For each specification, we control for individual fixed effects and date fixed effects. The standard errors are clustered at the city level.

	(1)	(2)	(3)
Panel A	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase	-0.0021	0.0008	0.0001
	(0.0007)	(0.0005)	(0.0006)
Observations	2,276	2,276	2,276
R-squared	0.4066	0.3795	0.3774
Panel B. Extensive Margin	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase dummy	-1.7075	0.5716	-0.3937
	(0.5637)	(0.7990)	(0.9724)
Observations	2,276	2,276	2,276
R-squared	0.4083	0.3797	0.3775
Panel C. Intensive Margin	Δcngdp20q1	Δhbgdp20q1	Δprovgdp20q1
Δcase	-0.0065	-0.0005	-0.0008
	(0.0000)	(0.0000)	(0.0001)
Observations	278	278	278
R-squared	0.3903	0.4035	0.3889
Individual FE	YES	YES	YES
Date FE	YES	YES	YES

Table A.8. Impact of Work Resumption Rate on Other Economic Expectations Based on RCT

Note: This table explores the impact of economic recovery perception on other economic expectations following Equation (3). The sample contains the third wave of survey. The outcomes are the revision on expected GDP growth rate in China (columns (1) and (2) of Panel A), in Hubei province (columns (3) and (4) of Panel B), and in their own resident province (columns (1) and (2) of Panel B) in Q1 2020; the outcome is the revision on expectation on GDP growth rate in China in 2022 in column 4 of Panel B. For each specification in columns (1) and (3), there is no control variable. For each specification in columns (2) and (4), we control for city fixed effects and demographics characteristics, including gender, age, marriage, education and industry. The standard errors are clustered at the city level.

	(1)	(2)	(3)	(4)
Panel A	Δcncpi20q1	Δcncpi20q1	Δhbcpi20q1	Δhbcpi20q1
T1 (highest city)	-1.0021	-0.6163	0.1387	0.7419
	(0.6377)	(0.6100)	(0.7540)	(0.7617)
T2 (lowest city)	0.3320	0.4903	0.3174	0.7310
	(0.7268)	(0.7488)	(0.8570)	(0.9353)
T3 (Beijing)	0.9775	0.8673	0.5346	0.5996
	(1.0313)	(0.8193)	(0.9232)	(0.6244)
T4 (Provincial capital)	-0.2429	-0.1813	-0.0432	0.0792
	(0.8355)	(0.9448)	(0.5803)	(0.6053)
Δresumption rate	-0.0071	-0.0081	-0.0037	0.0034
	(0.0060)	(0.0080)	(0.0051)	(0.0064)
T1 × Δresumption rate	-0.0075	-0.0116	0.0007	-0.0123
	(0.0188)	(0.0190)	(0.0218)	(0.0235)
T2 × Δresumption rate	-0.0158	-0.0161	0.0008	-0.0145
	(0.0200)	(0.0221)	(0.0181)	(0.0208)
T3 × Δresumption rate	-0.0116	0.0050	0.0052	0.0069
	(0.0218)	(0.0188)	(0.0195)	(0.0146)
T4 × Δresumption rate	0.0115	0.0185	-0.0014	-0.0014
	(0.0116)	(0.0147)	(0.0112)	(0.0123)
Constant	0.4519	3.6616	0.2150	1.7772
	(0.3425)	(1.9129)	(0.2423)	(2.1080)
Observations	936	922	936	922
R-squared	0.0145	0.1094	0.0019	0.1005

Panel B	Δprovcpi20q1	Δprovcpi20q1	Δcngdp2022	Δcngdp2022
T1 (highest city)	0.0474	0.6120	-3.1581	-2.5320
	(0.6299)	(0.5595)	(1.2068)	(1.3993)
T2 (lowest city)	0.4280	0.8766	0.2973	0.3552
	(0.5936)	(0.7338)	(1.3081)	(1.1203)
T3 (Beijing)	0.1614	0.3416	-0.8633	-0.9219
	(0.8872)	(0.7161)	(1.6951)	(1.5603)
T4 (Provincial capital)	0.1974	0.3140	-1.6837	-1.5542
	(0.7619)	(0.8327)	(1.0729)	(1.0227)
Δresumption rate	0.0012	0.0066	-0.0480	-0.0248
	(0.0073)	(0.0089)	(0.0312)	(0.0269)
T1 × Δresumption rate	-0.0011	-0.0141	0.0278	0.0060
	(0.0169)	(0.0133)	(0.0423)	(0.0355)
T2 × Δresumption rate	-0.0054	-0.0180	-0.0268	-0.0518
	(0.0187)	(0.0224)	(0.0461)	(0.0460)
T3 × Δresumption rate	0.0060	0.0067	-0.0028	-0.0105
	(0.0215)	(0.0215)	(0.0587)	(0.0578)
T4 × Δresumption rate	0.0157	0.0218	0.0770	0.0571
	(0.0215)	(0.0257)	(0.0396)	(0.0324)
Constant	0.1294	3.6120	1.3599	-0.4954
	(0.2289)	(2.2720)	(0.9450)	(3.4034)
Observations	936	922	936	922
R-squared	0.0026	0.1103	0.0200	0.1202
City FE	NO	YES	NO	YES
Demographics	NO	YES	NO	YES

Table A.9. Impact of Work Resumption Rate on GDP Expectation Based on RCT Using Restricted Sample

Note: This table explores the impact of economic recovery perception on GDP expectations following Equation (3) using responses from individuals who report to trust our provided information. The sample contains the third wave of survey. The outcomes are the revision on expected GDP growth rate in China (columns (1) and (2)), in Hubei province (columns (3) and (4)), and in their own resident province (columns (5) and (6)) in Q1 2020. For each specification in columns (1), (3) and (5), there is no control variable. For each specification in columns (2), (4), and (6), we control for city fixed effects and demographics characteristics, including gender, age, marriage, education and industry. The standard errors are clustered at the city level.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Δcngdp20q1	Δcngdp20q1	Δhbgdp20q1	Δhbgdp20q1	Δprovgdp20q1	Δprovgdp20q1
T1 (highest city)	-0.7062	-0.5111	-0.2237	0.6594	-0.6309	-0.0724
	(0.4494)	(0.6019)	(0.6533)	(0.6381)	(0.6262)	(0.6279)
T2 (lowest city)	-0.2041	-0.3212	0.0344	0.6858	0.1676	0.5300
	(0.6537)	(0.6105)	(0.7720)	(0.6387)	(0.6829)	(0.5568)
T3 (Beijing)	1.2532	1.5891	1.1738	1.7415	0.3705	0.8721
	(0.8565)	(0.8320)	(0.8381)	(0.6596)	(0.8686)	(0.5972)
T4 (Provincial capital)	-0.3247	-0.0945	-0.0425	0.7828	-0.6226	0.0220
	(0.6610)	(0.7920)	(0.5742)	(0.5507)	(0.5316)	(0.4965)
Δresumption rate	-0.0014	-0.0035	-0.0082	0.0023	-0.0231	-0.0142
	(0.0242)	(0.0259)	(0.0213)	(0.0218)	(0.0194)	(0.0201)
T1 × Δresumption rate	0.0062	0.0057	0.0139	-0.0017	0.0209	0.0137
	(0.0299)	(0.0304)	(0.0252)	(0.0262)	(0.0239)	(0.0276)
T2 × Δresumption rate	-0.0151	-0.0061	0.0129	-0.0007	0.0176	0.0100
	(0.0340)	(0.0394)	(0.0225)	(0.0251)	(0.0183)	(0.0240)
T3 × Δresumption rate	-0.0255	-0.0253	-0.0189	-0.0294	0.0037	-0.0055
	(0.0351)	(0.0371)	(0.0320)	(0.0321)	(0.0300)	(0.0322)
T4 × Δresumption rate	0.0135	0.0139	0.0178	0.0096	0.0301	0.0251
	(0.0289)	(0.0301)	(0.0248)	(0.0262)	(0.0222)	(0.0239)

Constant	0.2966	0.8469	0.1575	0.1328	0.7578	0.7967
	(0.2802)	(2.3193)	(0.4582)	(1.4097)	(0.4321)	(1.5878)
Observations	768	756	768	756	768	756
R-squared	0.0093	0.0952	0.0062	0.1103	0.0067	0.1073
City FE	NO	YES	NO	YES	NO	YES
Demographics	NO	YES	NO	YES	NO	YES

Appendix B. Surveys of Economic Forecast after COVID-19

Wave 1

Thank you for participating in our survey. The survey is designed and implemented by researchers from Tsinghua University, National University of Singapore and Nanyang Technological University, for the purpose of understanding your opinion on the current COVID-19 epidemic and your expectation on economic performance.
Your identity and answer will be kept strictly confidential.

【Survey Note】
This is a longitudinal survey consisting of four waves. You are participating the first wave today.

【Reward】A maximum of 100 yuan.
You will get 10 yuan immediately after participating each wave of survey. After completing four waves, you can get 40 yuan in total. You can directly withdraw the cash from your wechat wallet.
In addition to that, if your prediction on the economic performance in the first quarter of 2020 is close to the actual numbers, you will get an additional 60 yuan cash rewards.

Please click『Start the Survey』to complete the questionnaire.

 Please click『Confirm』to confirm that you agree with the above rules.

1. Where is your last year permanent residence? [Single choice question]
- City center
- Other parts in the city
- Suburb
- Rural area

2. Which industry do you work in? [Single choice question]
- Agriculture
- Mining
- Manufacturing
- Electricity, Heat, Gas, Water production, and Supply
- Construction
- Transportation, Warehousing and Postal industry
- IT

- Wholesale and Retail
- Accommodation and Catering
- Finance
- Real Estate
- Science, Education, and Culture Department
- Medical Unit
- Other Service Industries
- Government
- Student
- Unemployed

3. What is your education level？ [Single choice question]

- Junior high (middle) school or below
- High school or equivalent
- Community college or equivalent
- Bachelor degree or equivalent

4. Your family monthly living expense, excluding mortgages and car loans,is about_____yuan. [Number filling question; range: 100-200000]

5. How many family members are living with you in your current residence (excluding yourself)? [Single choice question]

- None
- One
- Two
- Three
- Four
- Five
- Six
- Seven
- Eight and above

6. What is your marital status？ [Single choice question]

- Single
- Married
- Divorced
- Widowed

7. How many children do you have? [Single choice question]

- 0
- 1

- 2
- 3
- More than 3

8. Comparing with the people around you, what is your attitude towards risk? [Single choice question]
- Always try to avoid risk
- Sometimes try to avoid risk
- About the same as other people
- Sometimes try to bear more risk
- Always try to bear more risk

9. How many relatives, friends and colleagues that you often contact are in Hubei Province now (including permanent residence, visiting, and quarantine, etc.)? [Single choice question]
- 0
- 1
- 2
- 3-5
- 6-10
- 11-15
- 16-20
- More than 20

10. The change of nationwide general price level in 2019 was _ % year. (That is, based on the calculation of CPI, how much did the price level rise between the end of year 2018 and the end of year 2019?) [Fill in the Blank question; range: -100-100]

11. How certain are you regarding the answer you gave in the last question? (national general price level in 2019)? [Single choice question]
- Very uncertain
- Somewhat uncertain
- Neutral
- Somewhat certain
- Very certain

12. The change of national GDP level in 2019 was _ % year. (That is, how much did the GDP level increase between the end of year 2018 and the end of year 2019?) [Fill in the Blank question; range: -100-100]
13. How certain are you regarding the answer given in the last question? (the change of GDP level in 2019)? [Single choice question]
- Very uncertain

- Somewhat uncertain
- Neutral
- Somewhat certain
- Very certain

The following questions will ask you to predict the growth rate of gross domestic product (GDP) and the change of general price level in the future, please pay attention to the indexes and provinces that are specified in each question.

Please note some questions can win you a cash prize. These questions will show special marks. After all four rounds of surveys conclude, we will randomly select one question that you answered from those questions. If the difference between your prediction and the official statistics does not exceed 0.2 percentage, you will receive an additional 60 yuan in cash. Additional rewards will be given after all relevant statistics are released in the second quarter of this year.

(For example, in the randomly selected question, you predict that the national GDP growth rate in the first quarter will be 5.5%, and the actual GDP growth rate in the first quarter released by the National Statistics Bureau is 5.7%. You will get the 60 yuan cash rewards because the gap between your prediction and statistics is 0.2 percentage that meets the requirements.)

Reminder: prize winning question

14. The general price level in Hubei Province in 1st Quarter 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise from the end of March 2019 to the end of March 2020?) [Fill in the Blank question]

Reminder: prize winning question

15. The general price level in {{index. 'Region'}} in 1st Quarter 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise from the end of March 2019 to the end of March 2020?) [Fill in the Blank question]

Reminder: prize winning question

16. The national general price level in 1st Quarter 2020 (January-March 2020) will change _ %.. (That is, how much does the price level rise from

the end of March 2019 to the end of March 2020?) [Fill in the Blank question]

Reminder: prize winning question

17. The GDP growth rate of Hubei Province in 1st Quarter 2020 (January-March 2020) will be _ %. (That is, how much does the GDP level rise from the end of March 2019 to the end of March 2020?) [Fill in the Blank question]

Reminder: prize winning question

18. The GDP growth rate of {{index. 'Region'}} in 1st Quarter 2020 (January-March 2020) will be _ % year on year. (That is, how much does the GDP level rise from the end of March 2019 to the end of March 2020?) [Fill in the Blank question]

Reminder: prize winning question

19. The national GDP growth rate in 1st Quarter 2020 (January-March 2020) will be _ %. (That is, how much does the GDP level rise from the end of March 2019 to the end of March 2020?) [Fill in the Blank question]

You have completed all the prize winning questions and the following questions are not prize winning questions. Please keep answering based on your knowledge.

20. When do you think the coronavirus pandemic will end in China? (Marked by the termination of public health emergency response in all provinces) [Single choice question]

- March 2020
- April 2020
- May 2020
- June 2020
- 3rd Quarter (July-September) 2020
- 4th Quarter (October-December) 2020
- Not end in 2020

21. The national GDP growth rate in 2022 will be _%. (That is, how much does the GDP level rise from the end of 2021 to the end of 2022?) [Fill in the Blank question; interval of validity: -50-50]

22. The accumulated confirmed cases will increase _ in {{index. 'region'}} released by National Health Commission (NHS) tomorrow morning (that

is, increment from hour 0 to hour 24 today). [Fill in the Blank question; interval of validity: 0-20000]

23. The accumulated confirmed cases will increase _ in Hubei Province released by National Health Commission (NHS) tomorrow morning (that is, increasing number from hour 0 to hour 24 today). [Fill in the Blank question; interval of validity: 0-20000]

24. The accumulated confirmed cases nationwide (including Hong Kong, Macao and Taiwan regions) will increase _ released by National Health Commission (NHS) tomorrow morning (that is, increasing number from hour 0 to hour 24 today). [Fill in the Blank question; interval of validity: 0-20000]

25. Do you feel anxious about the current epidemic? [Single choice question]
- Not at all
- Slightly
- Somewhat
- Quite a bit
- Very much

26. How likely do you think that COVID-19 will affect you? (e.g. family or yourself infected, income affected, etc.) [Single choice question]
- Not at all
- Slightly
- Somewhat
- Quite a bit
- Very much

27. How much negative impact does COVID-19 have on you if COVID-19 affects you? (e.g. family or yourself infected, income affected, etc.) [Single choice question]
- Not at all
- Slightly
- Somewhat
- Quite a bit
- Very much

28. Have you resumed work (back to your usual workplace every workday instead of working from home)? [Single choice question]
- Yes, I have resumed work for more than one week.
- Yes, less than a week.
- No, expecting to resume work within one week.
- No, it seems impossible to resume work within a week.
- I have been working during the epidemic.

29. Did anyone you know tested positive for the novel coronavirus? [Multiple choices question]

- Myself
- Family members
- Relatives
- Friends
- Colleagues
- Neighbours
- Classmates
- Others
- None

30. Did anyone you know placed under quarantine because of the novel coronavirus? [Multiple choices question]

- Myself
- Families
- Relatives
- Friends
- Colleagues
- Neighbours
- Classmates
- Others
- None

31. How many times have you been to a grocery store or supermarket in the past seven days? [Single choice question]

- 0
- 1
- 2-3
- 4-5
- More than 5

32. As far as you know, the price of vegetables and fruits is now ____ compared to that before the outbreak of coronavirus? [Single choice question]

- more than 20% cheaper
- less than 20% cheaper
- the same
- less than 20% more expensive
- 20%-50% more expensive
- over 50% more expensive

33. As far as you know, the price of meat is now ____ compared to that before the outbreak of coronavirus? [Single choice question]

- more than 20% cheaper
- less than 20% cheaper
- the same
- less than 20% more expensive
- 20%-50% more expensive
- over 50% more expensive

34. Have you often been wearing masks when going out in the past seven days? [Single choice question]
- Yes, I have.
- No, because I did not have masks.
- No, because I thought that wearing a mask is useless.
- No, because I think the probability of being infected is very low.
- I have not been out recently.

35. How many masks do you have at home now? [Single choice question]
- None
- 1-10
- 11-50
- 51-100
- 101-200
- 201-500
- More than 500

36. How many masks do you think other families in your city have on average? [Single choice question]
- None
- 1-10
- 11-50
- 51-100
- 101-200
- 201-500
- More than 501

37. Considering the current economic situation, do you have any job-hopping plans in the near future? [Single choice question]
- I am confident about job-hopping for better opportunities and package.
- I will not take the initiative to find but will change jobs for good opportunities.
- I do not consider job-hopping.
- I will look for new opportunities since current job may not be continued.
- The current job may be cancelled and it is also difficult to find new opportunities.

38. In the last seven days, how many hours did you spend on watching COVID-19 related news every day? [Single choice question]

- 0
- Within 1 hour
- 1-2 hours
- 2-3 hours
- Over 3 hours

39. What is your most important channel to follow the epidemic news? [Single choice question]

- Newspapers
- Television
- Websites
- Official Wechat accounts or moments
- Weibo
- Direct communication with friends, families and colleagues

40. Have you adjusted your investment in stocks or funds in the past week? [Single choice question]

- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

41. Have you adjusted your investment in gold in the past week? [Single choice question]

•
No investment

- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

42. Have you adjusted your investment in wealth management products in the past week? [Single choice question]

•
No investment

- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

43. Have you adjusted your investment in property in the past week? [Single choice question]

•

No investment

- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

44. What is your plan to adjust your investment in stocks or funds in the next three months? [Single choice question]

- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

45. What is your plan to adjust your investment in gold in the next three months? [Single choice question]

- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

46. What is your plan to adjust your investment in wealth management product in the next three months? [Single choice question]

- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

47. What is your plan to adjust your investment in property in the next three months? [Single choice question]

- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased

- Substantially increased

Surveys of Economic Forecast after COVID-19
Wave 3

Thank you for participating in our survey. The survey is designed and implemented by researchers from Tsinghua University, National University of Singapore and Nanyang Technological University, for the purpose of understanding your opinion on the current COVID-19 epidemic and your expectation on economic performance.
Your identity and answer will be kept strictly confidential.

【Survey Note】

This is a longitudinal survey consisting of four waves. You are participating the third wave today.

【Reward】A maximum of 100 yuan.

You will get 10 yuan immediately after participating each wave of survey. After completing four waves, you can get 40 yuan in total. You can directly withdraw the cash from your wechat wallet.
In addition to that, if your prediction on the economic performance in the first quarter of 2020 is close to the actual numbers, you will get an additional 60 yuan cash rewards.

Please click『Start the Survey』to complete the questionnaire.

 Please click 『Confirm』to confirm that you agree with the above rules.

1. The current national work resumption rate is approximately__. (That is, work in the office or factory, or return to the original way before the epidemic; work from home unincluded.) [Fill in the Blank question; range: 0-100]

2. Please recall the polices to promote work resumption and economic recovery you have heard of after the last survey. To what extent do you think these policies will promote future economic growth? [Single choice question]

- Not at all
- Slightly
- Somewhat
- Quite a bit
- Very much

3. Since the last survey, you spend about _ a day paying attention to the news about the regional policies to promote work resumption and reviving the economy. [Single choice question]

- 0 hour
- Less than 1 hour
- 1-2 hours
- 2-3 hours
- Over 3 hours

The following questions will ask you to predict the growth rate of gross domestic product (GDP) and the change of the general price level in the future. Please pay attention to the indexes and provinces that are specified in each question. The forecasts you made in the last survey will be presented for your reference.

Please note that some questions are award winning questions which are labelled in the survey. After all four rounds of surveys conclude, we will randomly select one question from all of these questions. If the difference between your prediction and the official statistics does not exceed 0.2 percentage, you will receive an additional 60 yuan in cash. Additional rewards will be issued after all relevant statistics are released in the second quarter of this year.

(For example, in the randomly selected question, you predict that the national GDP growth rate in the first quarter will be 5.5%, and the actual GDP growth rate in the first quarter released by the National Bureau of Statistics is 5.7%. You will get the 60-yuan cash rewards because the gap between your prediction and statistics is 0.2 percentage that meets the requirements.)

Reminder: prize winning question

4. The general price level in Hubei Province in Q1 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise at the end of March 2020 compared to at the end of March 2019? Your prediction was {{index. 'Hubei Price Level'}} % in the previous round.) [Fill in the Blank question]

Reminder: prize winning question

5. The general price level in {{index. 'Region'}} in Q1 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise at the end of March 2020 compared to at the end of March 2019? Your prediction was {{index. 'Local Price Level'}} % in the previous round.) [Fill in the Blank question]

Reminder: prize winning question

6. The national general price level in Q1 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise at the end of March 2020 compared to at the end of March 2019? Your prediction was {{index.

'National Price Level'}} % in the previous round.) [Fill in the Blank question]

Reminder: prize winning question

7. The GDP growth rate of Hubei Province in Q1 2020 (January-March 2020) will be _ %. (That is, how many percent does the GDP increase at the end of March 2020 compared to at the end of March 2019? Your prediction was {{index. 'Hubei GDP'}} % in the previous round.) [Fill in the Blank question]

   Reminder: prize winning question

8. The GDP growth rate of {{index. 'Region'}} in Q1 2020 (January-March 2020) will be _ %. (That is, how many percent does the GDP increase at the end of March 2020 compared to at the end of March 2019? Your prediction was {{index. 'Local GDP'}} % in the previous round.) [Fill in the Blank question]

   Reminder: prize winning question

9. The national GDP growth rate in Q1 2020 (January-March 2020) will be _ %. (That is, how many percent does the GDP increase at the end of March 2020 compared to at the end of March 2019? Your prediction was {{index. 'National GDP'}} % in the previous round.) [Fill in the Blank question]

10. The national GDP growth rate in 2022 will be _%. (That is, how many percent does the GDP increase at the end of 2022 compared to at the end of 2021? Your prediction was {{index. 'National GDP Growth Rate'}} % in the previous round.) [Fill in the Blank question]

11. (Shown to T0 group) Next, we will show you some additional information to help you predict the change in price level and GDP. Please read the following information carefully. You will answer the prediction questions again after reading. The last reward will be based on your revised forecast.

    Tsinghua Tong Heng Cheng Shi Technology and Research Institute of Information Technology at Tsinghua University applied 'Grid+Big Data+AI' technology to study the daily 'population activity level in commercial areas' of each city. The indicator reflects the ratio of the number of active population in the top ten commercial areas on that day of each city to measure the average number of active population relative to in the same area from September to November 2019. It could be roughly referred to as the resumption rate of main business areas in the city on that day.
    According to the statistics, as of 11 March 2020, **the average work**

resumption rate in main commercial areas of 63 major cities (excluding cities in Hubei Province) in China is **65.6%**.
Please confirm that you have already read the information above carefully. The reward will be based on your predictions below.

- I see, next.

12. (Shown to T1 group) Next, we will show you some additional information to help you predict the change in price level and GDP. Please read the following information carefully. You will answer the prediction questions again after reading. The last reward will be based on your revised forecast.

    Tsinghua Tong Heng Cheng Shi Technology and Research Institute of Information Technology at Tsinghua University applied 'Grid+Big Data+AI' technology to study the daily 'population activity level in commercial areas' of each city. The indicator reflects the ratio of the number of active population in the top ten commercial areas on that day of each city to measure the average number of active population relative to in the same area from September to November 2019. It could be roughly referred to as the resumption rate of main business areas in the city on that day.
    According to the statistics, as of 11 March 2020, **the average work resumption rate** in main commercial areas of 63 major cities (excluding cities in Hubei Province) in China is **65.6%**. The statistics also show that **the highest work resumption rate** of the city is **80.7%.**
    Please confirm that you have already read the information above carefully. The prize will be based on your predictions below.

- I see, next.

13. (Shown to T2 group) Next, we will show you some additional information to help you predict the change in price level and GDP. Please read the following information carefully. You will answer the prediction questions again after reading. The last reward will be based on your revised forecast.

    Tsinghua Tong Heng Cheng Shi Technology and Research Institute of Information Technology at Tsinghua University applied 'Grid+Big Data+AI' technology to study the daily 'population activity level in commercial areas' of each city. The indicator reflects the ratio of the number of active population in the top ten commercial areas on that day of each city to measure the average number of active population relative to in the same area from September to November 2019. It could be roughly referred to as the resumption rate of main business areas in the city on that day.
    According to the statistics, as of 11 March 2020, **the average work resumption rate** in main commercial areas of 63 major cities (excluding

cities in Hubei Province) in China is **65.6%**. The statistics also show that **the lowest work resumption rate** of the city is **47.7%.**
Please confirm that you have already read the information above carefully. The reward will be based on your predictions below.

- I see, next.

14. (Shown to T3 group) Next, we will show you some additional information to help you predict the change in price level and GDP. Please read the following information carefully. You will answer the prediction questions again after reading. The last reward will be based on your revised forecast.

    Tsinghua Tong Heng Cheng Shi Technology and Research Institute of Information Technology at Tsinghua University applied 'Grid+Big Data+AI' technology to study the daily 'population activity level in commercial areas' of each city. The indicator reflects the ratio of the number of active population in the top ten commercial areas on that day of each city to measure the average number of active population relative to in the same area from September to November 2019. It could be roughly referred to as the resumption rate of main business areas in the city on that day.
    According to the statistics, as of 11 March 2020, the **average work resumption rate** in main commercial areas of 63 major cities (excluding cities in Hubei Province) in China is **65.6%**. The statistics also show that **the work resumption rate in Beijing** is **62.2%.**
    Please confirm that you have already read the information above carefully. The reward will be based on your predictions below.

- I see, next.

15. (Shown to T4 group) Next, we will show you some additional information to help you predict the change in price level and GDP. Please read the following information carefully. You will answer the prediction questions again after reading. The last reward will be based on your revised forecast.

    Tsinghua Tong Heng Cheng Shi Technology and Research Institute of Information Technology at Tsinghua University applied 'Grid+Big Data+AI' technology to study the daily 'population activity level in commercial areas' of each city. The indicator reflects the ratio of the number of active population in the top ten commercial areas on that day of each city to measure the average number of active population relative to in the same area from September to November 2019. It could be roughly referred to as the resumption rate of main business areas in the city on that day.
    According to the statistics, as of 11 March 2020, the **average work resumption rate** in main commercial areas of 63 major cities (excluding

cities in Hubei Province) in China is **65.6%**. The statistics also show that **the work resumption rate** is **64.6% in Shenyang, 64.2% in Guangzhou, 48.8% in Fuzhou, 68.3% in Hohhot, 70.9% in Chengdu, 66.4% in Changsha, 30.3% in Wuhan. (the number of the respondent's resident province will be presented to him/her.)**
Please confirm that you have already read the information above carefully. The reward will be based on your predictions below.

- I see, next.

You will have the chance to modify your prediction of the growth rate of GDP and change in the general price level. Please note that, if the answers of this round (3rd round) are selected, we will use the revised prediction. That means, your answers above are invalid and will not be referred to determine the final reward.
Please do not return to the previous questions to modify the result. Fill the revised prediction in the following questions. The revised number will determine the final reward.
Reminder: prize winning question

16. The general price level in Hubei Province in 1st Quarter 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise from the end of March 2019 to the end of March 2020? Please fill in the revised prediction.) [Fill in the Blank question]

Reminder: prize winning question

17. The general price level in {{index. 'Region'}} in 1st Quarter 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise from the end of March 2019 to the end of March 2020? Please fill in the revised prediction.) [Fill in the Blank question]

Reminder: prize winning question

18. The national general price level in 1st Quarter 2020 (January-March 2020) will change _ %. (That is, how much does the price level rise from the end of March 2019 to the end of March 2020? Please fill in the revised prediction.) [Fill in the Blank question]

Reminder: prize winning question

19. The GDP growth rate of Hubei Province in 1st Quarter 2020 (January-March 2020) will be _ %. (That is, how much does the GDP level rise from the end of March 2019 to the end of March 2020? Please fill in the revised prediction.) [Fill in the Blank question]

Reminder: prize winning question

20. The GDP growth rate of {{index. 'Region'}} in 1st Quarter 2020 (January-

March 2020) will be _ %. (That is, how much does the GDP level rise from the end of March 2019 to the end of March 2020? Please fill in the revised prediction.) [Fill in the Blank question]

Reminder: prize winning question

21. The national GDP growth rate in 1st Quarter 2020 (January-March 2020) will be _ %. (That is, how much does the GDP level rise from the end of March 2019 to the end of March 2020? Please fill in the revised prediction.) [Fill in the Blank question]

You have completed all the prize winning questions and the following questions are not prize winning questions. Please keep answering based on your knowledge.

22. You predict that the national GDP growth rate in 2022 will be _% year on year. (That is, how much does the GDP level rise from the end of 2021 to the end of 2022? Please fill in the revised prediction.) [Fill in the Blank question; range: -50-50]

23. When do you think this coronavirus pandemic will end in China? (Marked by the termination of public health emergency response in all provinces) [Single choice question]

- March 2020
- April 2020
- May 2020
- June 2020
- 3rd Quarter (July-September) 2020
- 4th Quarter (October-December) 2020
- Not end in 2020

24. To what extent do you think the work resumption statistics above will help you modify predictions? [Single choice question]

- Not at all
- Slightly
- Somewhat
- Quite a bit
- Very much

25. Do you think the work resumption statistics above are credible? [Single choice question]

- No, I never heard of this institution.
- No, I think the statistical method is false.

- No (for other reasons).
- Yes, I believe in the objectivity of this institution.
- Yes, I believe in the academic level of this institution.
- Yes, I think it reflects the real work resumption rate using this statistical method.
- Yes (for other reasons).

26. The accumulated confirmed cases will increase _ in {{index. 'region'}} released by National Health Commission (NHS) tomorrow morning (that is, increment from hour 0 to hour 24 today). [Fill in the Blank question; range: 0-20000]

27. The accumulated confirmed cases will increase _ in Hubei Province released by National Health Commission (NHS) tomorrow morning (that is, increment from hour 0 to hour 24 today). [Fill in the Blank question; range: 0-20000]

28. The accumulated nationwide confirmed cases (including Hubei Province, Hong Kong, Macao and Taiwan regions) will increase _ released by National Health Commission (NHS) tomorrow morning (that is, increment from hour 0 to hour 24 today). [Fill in the Blank question; range: 0-20000]

29. Do you feel anxious about the current epidemic? [Single choice question]
- Not at all
- Slightly
- Somewhat
- Quite a bit
- Very much

30. How likely do you think that COVID-19 will affect you? (e.g. family or yourself infected, income affected, etc.) [Single choice question]
- Not at all
- Slightly
- Somewhat
- Quite a bit
- Very much

31. How much negative impact does COVID-19 have on you if COVID-19 affects you? (e.g. family or yourself infected, income affected, etc.) [Single choice question]
- Not at all

- Slightly
- Somewhat
- Quite a bit
- Very much

32. Have you resumed work (back to your usual workplace every workday instead of working from home)? [Single choice question]
- Yes, I have resumed work for more than one week.
- Yes, less than one week.
- No, expecting to resume work within one week.
- No, it seems impossible to resume work within a week.
- I have been working normally during the epidemic.

33. Did anyone you know tested positive for the novel coronavirus? [Multiple choices question]
- Myself
- Family members
- Relatives
- Friends
- Colleagues
- Neighbours
- Classmates
- Others
- None

34. Did anyone you know placed under quarantine because of the novel coronavirus? [Multiple choices question]
- Myself
- Family members
- Relatives
- Friends
- Colleagues
- Neighbours
- Classmates
- Others
- None

35. How many times have you been to a market or grocery store in the past seven days? [Single choice question]
- 0

- 1
- 2-3
- 4-5
- More than 5

36. As far as you know, the price of vegetables and fruits is now ____ compared to that before the outbreak of coronavirus? [Single choice question]
- more than 20% cheaper
- less than 20% cheaper
- the same
- less than 20% more expensive
- 20%-50% more expensive
- more than 50% more expensive

37. As far as you know, the price of meat is now ____ compared to that before the outbreak of coronavirus? [Single choice question]
- more than 20% cheaper
- less than 20% cheaper
- the same
- less than 20% more expensive
- 20%-50% more expensive
- more than 50% more expensive

38. Have you often been wearing masks when going out in the past seven days? [Single choice question]
- Yes, I have.
- No, because I did not have masks.
- No, because I thought that wearing a mask is useless.
- No, because I think the probability of being infected is very low.
- I have not been out recently.

39. How many masks do you have at home now? [Single choice question]
- None
- 1-10
- 11-50
- 51-100
- 101-200
- 201-500
- More than 500

40. How many masks do you think other families in your city have on average? [Single choice question]
- None
- 1-10
- 11-50
- 51-100
- 101-200
- 201-500
- More than 501

41. Considering the current economic situation, do you have any job-hopping plans in the near future? [Single choice question]
- I am confident about job-hopping for better opportunities and package.
- I will not take the initiative to find but will change jobs for good opportunities.
- I do not consider job-hopping.
- I will look for new opportunities since the current job may not be continued.
- The current job may be cancelled and it is also difficult to find new opportunities.

42. In the last seven days, how many hours did you spend on watching COVID-19 related news every day? [Single choice question]
- 0
- Within 1 hour
- 1-2 hours
- 2-3 hours
- Over 3 hours

43. What is your most important channel to follow the epidemic news? [Single choice question]
- Newspapers
- Television
- Websites
- Official Wechat accounts or moments
- Weibo
- Direct communication with friends, families and colleagues

44. Have you adjusted your investment in stocks or funds in the past week? [Single choice question]
- No investment

- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

45. Have you adjusted your investment in gold in the past week? [Single choice question]
- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

46. Have you adjusted your investment in wealth management products in the past week? [Single choice question]
- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

47. Have you adjusted your investment in property in the past week? [Single choice question]
- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

48. What is your plan to adjust your investment in stocks or funds in the next three months? [Single choice question]
- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased

- Substantially increased

49. What is your plan to adjust your investment in gold in the next three months? [Single choice question]
- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

50. What is your plan to adjust your investment in wealth management products in the next three months? [Single choice question]
- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased

51. What is your plan to adjust your investment in property in the next three months? [Single choice question]
- No investment
- Substantially reduced
- Slightly reduced
- No adjustment
- Slightly increased
- Substantially increased