NBER WORKING PAPER SERIES

STOCK MARKET STIMULUS

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Working Paper 29827
http://www.nber.org/papers/w29827

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 2022

We are grateful to Raj Chetty, John Friedman, and Dawn Nettles for sharing data. We thank Valerie Baldinger of the New York Federal Reserve, Nithin Kavi of Harvard College, and especially Cody Wan of NYU for excellent research assistance. We thank seminar participants at Harvard Business School and NYU Stern School of Business for comments. The Division of Research at the Harvard Business School provided research support. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

At least one co-author has disclosed additional relationships of potential relevance for this research. Further information is available online at http://www.nber.org/papers/w29827.ack

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NBER Working Paper No. 29827
March 2022
JEL No. E62,G0,G14,G38,G4

ABSTRACT

We study the stock market effects of the arrival of the three rounds of "stimulus checks" to U.S. taxpayers and the single round of direct payments to Hong Kong citizens. The first two rounds of U.S. checks appear to have increased retail buying and share prices of retail-dominated portfolios. The Hong Kong payments increased overall market turnover and share prices in Hong Kong and mainland Chinese markets, especially in large-cap portfolios. We cannot rule out that these price effects were permanent. The findings raise novel questions about the role of fiscal stimulus in the stock market.

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"The Stimulus Has Landed."

- Robinhood newsletter to 30 million subscribers, March 15, 2021

1 Introduction

The quote above was the headline of an article on Robinhood, the trading platform popular with retail investors, upon the arrival of the third round of pandemic-era stimulus payments into millions of taxpayers' accounts. These Economic Impact Payments, better known as "stimulus checks," followed a first round in mid-April 2020 and a second round in early January 2021. In total, approximately $814 billion has been disbursed through these payments.

Surveys suggest that on the order of 10%-15% of these funds may have shortly found their way into the stock market.[1] Table 1 provides some motivating anecdotes. There are bursts of discussion about stimulus checks in popular online discussion venues around each of the stimulus acts. Some of the posts were retweeted thousands of times or from accounts with large followings. As Figure 1 shows, such discussions took place in the context of significant growth in retail trading accounts and stock prices. The boom is especially pronounced in stocks that retail investors tend to favor.

Did the stimulus checks—ostensibly an instrument of fiscal policy intended for temporary economic relief of American households in an unprecedented situation—actually affect the stock market when they were delivered? In light of the sums involved, the temporal concentration of checks to households idled by the pandemic and increasingly active in online trading, the otherwise surprising rise in stock prices over the course of the pandemic, particularly in stocks popular with retail investors, and the large and growing literature

[1] Per US Census Bureau surveys and Thatte, Jalagani, and Chadha (2021), discussed later.

documenting price responses to investor demand shocks, it is reasonable to suspect some impact. In this paper, we find that the stimulus payments did indeed increase trading and prices of stocks most popular with retail investors. This is apparent both in the U.S. data and in a related experiment in Hong Kong.

There are two non-mutually exclusive channels through which stimulus funds could impact the stock market. The first comes immediately to mind: The market should react swiftly to the announcement of provisions in the stimulus acts that bear on fundamentals, including but certainly not limited to the direct payments to households, insofar as these payments alter the value of cash flows to shareholders. There is little debate that well over $5 trillion in total stimulus spending would bolster firm fundamentals. We confirm this in the context of the CARES Act, which among many provisions authorized the first round of stimulus checks.

The second channel, which is the main focus of this paper, is more surprising. It arises through the price impact of waves of stimulus funds when they actually enter the stock market. In this channel, as yet unstudied in the literature, retail investors use some portion of stimulus funds to invest in stocks, but in light of downward-sloping demand curves these funds drive up prices of the stocks they target.

Importantly, the first channel would be reflected around the announcement of the stimulus acts, and the second channel would be reflected weeks later upon the arrival of the checks to retail investors. Our main analysis therefore begins with a careful determination of the effective date of the arrival of the checks, specifically the roughly 100 million directly-deposited payments that make up the *leading edge* of each round and constitute most of the eventual payout. We can pin down this event date based on credit card-level spending data, which show an obvious jump when checks first arrived, and further corroborate it by discussions in online chatrooms.

We then proceed to show that the distribution of the stimulus checks was associated with increases in retail trading that basically mirror the increases in credit card spending. We use the algorithm of Boehmer, Jones, Zhang, and Zhang (2021) to estimate stock-day-level measures of retail-initiated buys and sells. Aggregating the stock-level measures to the market level, we find that the stimulus check disbursement days saw increases in retail trading, and particularly retail-initiated buy trades. Digging deeper, we find that stocks with large past retail trading volume see the largest increases in retail trading activity around check disbursement dates. That is, the stocks that retail investors already had their eyes on were the most bought with stimulus check inflows.

Finally, we confirm that these trading effects increased prices. High-retail-share portfolios experience abnormal returns of about 5-7% within a few days of the first and second rounds of stimulus checks, but no effects on the third round. At a longer three-week horizon, these effects grow to abnormal returns of 10-18% around the first round of stimulus payments, 13-24% in the second round, and again nothing in the third round (with point estimates insignificantly negative). Interestingly, value-weighted market returns over these windows are close to zero. We repeat the analysis for other sorting variables that seek to capture stocks favored by retail investors, or stocks that are susceptible to such retail demand. We find that effects of stimulus payments were strongest among those stocks with high number of Robinhood-using owners, high retail trading according to FINRA, small cap, low nominal price, and high volatility stocks.

The United States is not the only country with a Covid-19 response that included direct payments. We also study the impacts of the Hong Kong's Cash Payout Scheme (CPS) of July 2020, which represents a smaller but cleaner experiment. The Hong Kong payments had stock market effects as well. In Hong Kong, famous for its extensive retail investment community,[2] the stimulus checks coincide with a sharp increase in prices and volume in the local market as well as in the two major mainland Chinese markets to which Hong Kongers have access. Again, the stocks that were already most traded—which in Hong Kong means large caps—experienced the biggest volume and price effects.

Our findings are related to other studies of how investors spent their stimulus checks. Baker, Farrokhnia, Meyer, Pagel, and Yanellis (2020), Coibion, Gorodnichenko, and Weber (2020), and Parker, Schild, Erhard, and Johnson (2022) carefully study consumption patterns. Parker et al. find that people spent less of their EIPs in the months following check arrival than in similar previous policy episodes, with a potential implication that they invested more funds in the stock market. Divakaruni and Zimmerman (2021) finds an increase in Bitcoin buy trades for exactly $1200, the modal amount of the CARES Act checks, for up to three weeks after the first checks arrived. There is no reason to expect that the duration of trading effects in the stock market is any different, so we tabulate returns up to this same horizon.

Our findings also shed new light on the consequences of the return of retail investing. Barber, Huang, Odean and Schwarz (2021), Eaton, Green, Roseman and Wu (2021), and Welch (2021) describe the behavior and role of retail traders on the Robinhood platform. In the pandemic context, Cox, Greenwald, and Ludvigson (2020) conclude that the post-March 2020 rebound "has been driven more by sentiment than substance." Levine (2020) coined the term

[2] See, for example, https://fundselectorasia.com/hong-kong-tops-world-for-retail-share-traders/.

"bored markets hypothesis" to describe individuals beginning to invest because the trading platforms make it fun and there was nothing better to do; Ozik, Sadka, and Shen (2021) exploit staggered stay-at-home advisories to show that retail trading and liquidity increased when retail investors had more free time.

The paper proceeds as follows. Section 2 gives background on the stimulus acts and the structure of the stimulus payments. Section 3 explores how the checks affected trading, and Section 4 explores the effect on prices. Section 5 studies the same questions in the context of the Hong Kong stimulus payment. Section 6 concludes.

2 The U.S. Stimulus Acts and Economic Impact Payments

Our analysis begins with a recounting of the background economic and health context. We next turn to an overview of the legislation authorizing stimulus checks. We then discuss the market reaction to the CARES Act passage, the basic structure of the three waves of payments, and the determination when each round of stimulus checks first became investable.

2.1 Context

We begin with a recounting of the health and economic context in which the major stimulus acts were passed. The top panel of Figure 2 plots new Covid-19 cases against the unemployment rate as a crude measure of economic activity. Unemployment insurance claims soared to a weekly rate of over 6 million as businesses closed in late March 2020. The infection rate rose and fell in waves over this period, each time upsetting politics and plans.

The bottom panel compares two more measures of aggregate economic activity—aggregate spending versus one year earlier, and time away from home—based on data from the

Opportunity Insights Economic Tracker.[3] Time away from home plummets as a result of lockdowns, voluntary behavior, and the contraction of employment. For these and other reasons, total spending fell by over 30% relative to January 2020. There is a slow return to normalcy in all indicators by the end of the sample, although jobless claims remain high.

2.2 Overview of the Stimulus Acts

Congress passed three multifaceted acts to provide economic stimulus. One feature of each was direct taxpayer relief to around 170 million households in the form of Economic Impact Payments that are our main focus, but it is important to remember that these were only a portion of sprawling pieces of legislation.

The first round of stimulus came as part of the Coronavirus Aid, Relief and Economic Security Act (CARES), which was passed by Congress and signed by President Trump on March 25, 2020. The CARES Act authorized over $2 trillion in spending, including loan and grant programs for small businesses, support for medical providers, support for states, payments for businesses and industries affected by the pandemic, enhanced unemployment benefits, and direct cash disbursements to individual citizens. Notably, fewer than ten of the 335 pages of the CARES Act text are devoted to the stimulus checks, although at a $292 billion budgetary cost they represent a nontrivial fraction of its total cost.[4]

We think about the fundamental impacts of the stimulus acts through the lens of efficient markets, in which the market should react to all provisions in the Acts that bear on stock fundamentals: provisions for public health; direct payments to households (i.e., expected stimulative effect of the checks that bear on firm fundamentals, such as through a consumption

[3] https://opportunityinsights.org/tracker-resources/. We thank Raj Chetty and Jon Friedman for advice on using these data. For a thorough accounting of the economic impacts of the onset of Covid-19, see Chetty, Friedman, Hendren, Stepner, and The Opportunity Insights Team (2020).

[4] Cost figures from https://crsreports.congress.gov/product/pdf/IN/IN11605.

wealth effect); small business lending; support for unemployed workers; provisions to support specific industries; the signal, strongest in the case of the CARES Act, that the federal government can act with scope and speed, increasing the probability of additional stimulus; and so on. All these fundamental impacts should be summarily expressed in the announcement effect to the extent that they were not anticipated.

And, indeed, the CARES Act was received as a large positive shock to fundamentals. After a crash of -30.7% in the CRSP value-weighted index from Monday, February 3 through Monday, March 23, 2020, passage of the Act was received as good news. Contemporaneous media accounts date the market impact to Tuesday, March 24 through Thursday, March 26 as a series of political hurdles were resolved, and the three-day CRSP value-weighted market return over this period was +17.3%.[5]

The cross-industry reaction pattern is particularly convincing evidence of a revision to fundamentals. For each Fama-French 49 industry portfolio, Figure 3 plots the announcement effect of CARES against the crash return. If the cross-industry pattern of declines can be attributed to deteriorating fundamentals, the restorative pattern upon the passage of CARES could be ascribed to rebounding fundamentals.[6] Investors clearly interpreted the CARES Act as coming to the rescue of sectors that they felt would be most affected by the pandemic.

[5] See, for example, "Dow Rallies 6.4% After Stimulus Vote; The blue-chip index is now up 20% from its low, qualifying as a new bull market" (Caitlin McCabe, Anna Hirtenstein and Chong Koh Ping, *Wall Street Journal Online* March 26, 2020).

[6] The two outliers in Figure 3, aircraft and coal, can be understood as follows. Airlines and aircraft and related contractors faced enormous losses as borders closed indefinitely. The CARES Act included extensive provisions related to such firms. These included benefits to firms "critical to maintaining national security," which include Boeing, General Dynamics, and Raytheon, all members of this Fama-French industry; an extensive list of support for airline workers and contractors; and billions in grants, loans, and loan guarantees. Coal is another exception that proves the rule. "Despite concerted lobby efforts from the U.S. coal industry, including the National Mining Association, it will not be receiving direct assistance under the voted through CARES Act." (https://www.gem.wiki/CARES_Act_and_Fossil_Fuels).

The second round of payments came as part of the Consolidated Appropriations Act of 2021, a $2.3 trillion spending bill that combined $900 billion in Covid relief funds with a $1.4 trillion omnibus spending bill. It was passed by Congress on November 21, 2020, and after a bit of political uncertainty was signed into law on December 27, 2020. The budgetary cost of the stimulus checks here was $164 billion.

Finally, the third round of payments was the result of the $1.9 trillion American Rescue Plan Act, passed on March 10, 2021, and signed by President Biden the next day. The budgetary cost of these checks was $410 billion.

We were not able to find clear market jumps around news of the second two stimulus acts, however. We suspect this is because major uncertainties were resolved by CARES and because these acts were in discussion for weeks and the probability of passage tracked upward only slowly. The absence of a spike in returns in a narrow window around passage hardly rules out these acts offered additional, fundamentals-based support to stocks.

It is perhaps obvious that any effects of the actual arrival of the stimulus checks to retail investors are of an entirely different character. The huge announcement effect of CARES does not constitute a meaningful benchmark by which such effects might be judged. The stimulus checks were both preannounced and represented only a fraction of the immense, complex stimulus acts. Within the logic of the efficient markets hypothesis, preannounced payments should generate no price reaction since rational expectations should have incorporated them weeks before. Any remaining stock market effect we see on the actual arrival of the checks is likely to present a lower bound on the total "demand curve" effect. We turn next to the checks themselves.

2.3 The Structure of Stimulus Checks

Table 2, which is based on U.S. Treasury press releases, GAO reports, and Baker et al. (2020), provides an overview of the structure of the authorizing acts and the stimulus payments in particular. Most households qualified for direct payments. Under CARES, for example, all adults with a social security number who filed taxes and with incomes less than $99,000 (individual) or $198,000 (married) were eligible for something, with the size of the payment phasing out with higher incomes.

The details of eligibility vary slightly from one stimulus act to the next, but the basic structure of the payment of the checks is consistent. In an initial wave, the funds were directly deposited to households with account information on file with the IRS. Those without such information on file typically received paper checks with a delay due in part to IRS printing capacity constraints. For simplicity, we use the popular terminology and refer to both forms of payment as stimulus checks unless clarification is useful.

The last panel of the table details the Treasury-reported timing of disbursements, based on periodic press releases that do not pin down exact dates. Approximately $160 billion, or 59% of the total eventually disbursed in the CARES Act, arrived via 89 million direct deposits with an official check date of April 17. The remaining $110 billion was disbursed in several waves over the next two months because the Treasury could print only a few million paper checks per week. In total, at least 168 million tax filers received payments of some amount.

As of this writing, the total disbursed in the three rounds was at least $276 billion, $147 billion, and $391 billion, respectively, for a grand total of $814 billion. Based on the reported total number of payments we can deduce the average dollar amount of the stimulus checks. The first Economic Impact Payment (under the CARES Act), i.e., the first EIP or stimulus check, averaged $1,643. The second EIP (under the Consolidated Appropriations Act) averaged $955. The third EIP (under the American Rescue Plan Act) averaged $2,341.

2.4 Identifying First Actual Payment Dates

The "First Actual Payment Date" in Table 2 is an important date for our analysis. The timing of the full distribution of the checks, and when they became investable as opposed to arriving in a mailbox, is unknown. Consequently, we focus on the more specific, measurable notion of the *first day in which those receiving the first wave of direct deposits could invest the funds*. Fortunately, in each of the three rounds of stimulus checks, around 100 million payments—constituting most of the eventual total—were made in an initial slug of direct deposits. The first *trading* day on which these funds were available is our date [t=0], the date on which we might first see a direct demand effect.

The Treasury gives a loose "official" payment date, but other data sources help us identify the first actual payment date in the sense that we can study. Social media discussions and detailed data on retail spending are compelling. Figure 4 shows retail spending over the course of the sample period. To make use of the fact that the stimulus checks were particularly important for low-income households, we plot the difference in non-grocery retail spending between low-income and high-income zip codes based on Opportunity Insights credit card data. The units of this series are in cumulative percentage change compared to baseline January 2020 spending. An increase in this measure indicates that consumers in low-income ZIP codes are increasing their spending on non-grocery retail more than consumers in high income ZIP codes. Since consumers in low-income ZIP codes are more likely to be liquidity constrained, this is a good indicator that stimulus checks have started to reach consumers; consistent with this intuition, Parker et al. (2013) find that the 2008 economic stimulus payments boosted spending among lower-income households, and Baker et al. (2020) and Coibon et al. (2020) find a similar differential for the CARES Act payments.

The three dashed vertical lines in Figure 4 represent the passage dates of the Acts authorizing the spending. The solid vertical lines show our estimates of when the funds became available to consumers (first of the pair of solid lines, as more precisely located below), which is what we are after for date 0, and the official check dates as reported by the Treasury (second of the pair of the solid lines). The figure shows that consumers, especially those in low-income zip codes, began spending their stimulus checks as soon as they became available and generally days before the official Treasury check dates.

The closeups in Figure 5 help us pin down the first actual payment dates. Each panel corresponds to a round of stimulus. At a minimum, retail investors knew about the arrival of the checks, as evidenced by their message board activity. The solid grey line in Figure 5 shows the number of posts on the "r/stimuluscheck" subreddit message board, which peaks just as the first payments are being made for each round. The blue dotted line again shows the low-minus-high-income data on non-grocery retail spending from Opportunity Insights. Days in which the U.S. stock market was closed are shaded out. Based on these data, and other retail spending categories and lottery ticket sales (omitted for brevity), point to 4/13/20, 12/30/20, and 3/12/21 as best estimates for the first actual payment date of the three rounds of stimulus checks. These are the dates reported in Table 2. The first date of 4/13/20 receives a sort of out-of-sample support from Divakurani and Zimmerman (2021), as it is the first day in which there is a persistent, statistically significant increase in the number of $1,200 Bitcoin buy trades.

3 Effect of U.S. Stimulus Checks on Stock Trading

3.1 Surveys

What fraction of the $814 billion of stimulus checks described in Table 2 might have swiftly made its way into the stock market? There are no direct measures, but some surveys shed a bit of light.

Beginning in late April 2020, the US Census Bureau, in conjunction with five other government agencies, administered weekly surveys asking individuals about their employment status, spending, housing, access to health care, and educational disruptions. In addition, in weeks 12, 22, and 27, the survey asked respondents about their receipt or expected receipt of a check (corresponding to EIP1, EIP2, and EIP3) and their expected use of the proceeds. Table 3 summarizes the findings. 9.3% of households surveyed mostly invested or saved their first stimulus check. For the second check, this rose slightly to 15.1%. For the third stimulus check, 18.7% reported mostly saving or investing the proceeds. These estimates are a lower bound on the population-wide percentages, because a substantial portion of respondents (e.g., 42.4% in the third survey) did not provide a breakdown of their spending.

A second survey was conducted in July 2020 by Coibon et al. (2020). They survey the Nielsen Homescan panel of representative U.S. individuals about (in part) their use of CARES Act stimulus payments. Of those who report receiving a check, 33% say they used it "mostly to increase savings."

Although these surveys demonstrate that a meaningful fraction of the stimulus dollars were saved or invested, they did not ask whether that money went into the stock market. A survey by Deutsche Bank DIG Primary Research, which conducted a survey of 430 users of online broker platforms over February 5-9, 2021, speaks to this point.[7] Bearing in mind their selected sample—although perhaps not highly unrepresentative since there are over 100 million online brokerage accounts in the U.S.—72% of respondents reported receiving a stimulus payment and over half of those said they investing some of the payment in the stock market. The authors suggest that up to $170 billion of the third stimulus checks (EIP3) alone could be invested into stocks.

A fourth relevant survey by SaverLife is studied by Baker et al. (2020). This firm also asked its users about the receipt and use of stimulus checks, which it could match to spending data. The fascinating result of this study is that users who believed that a stock market rise was "likely" showed an MPC of less than 0.1 after the first stimulus payment, while those who considered such a rise "unlikely" displayed an MPC that was greater than 0.5.

Based on upon a triangulation of the surveys, with their attendant errors, low response rates, and biases, a reasonable estimate might be 10-15% of the total stimulus check payout of $814 billion. This would imply a point estimate of $100 billion. This is notably less than the Deutsche Bank survey, but reflects more of a balance with other information.

3.2 Retail Trading Upon Check Arrival

Which stocks to focus on? $100 billion is well under 1% of the U.S. stock market capitalization. The stimulus checks could hardly overwhelm the whole stock market. At the same time, they are unusual shocks in being entirely new money, as opposed to funds due to reallocation across stocks, and they could lead to potentially millions of liquidity-demanding market orders. The funds are also in the hands of retail investors that disproportionately invest

[7] Parag Thatte, Srineel Jalagani, and Binky Chadha, "Investor Position and Flows" Deutsche Bank Research, 21 February 2021. The survey was conducted by Ben Novak of dbDIG Primary Research.

in a subset of stocks. A natural hypothesis is that trading (and returns) effects are most likely to appear among stocks with the greatest retail interest. Figure 1 showed that such stocks have had standout performance in the post-crash market.

Our main measures of retail order buys and sells are based on the algorithm of Boehmer, Jones, Zhang, and Zhang (2021). Their method exploits the practice that retail order flow, but not institutional order flow, receives price improvement measured in fractions of a penny per share. We apply their algorithm to the trades marked with exchange code "D" (meaning trades reported to the Financial Industry Regulatory Authority Trade Reporting Facility) on the TAQ database. Following Boehmer et al., transactions are classified as retail buys if the fraction of a penny of trade price is between .6 and 1, and as retail sells if the fractional penny of a trade is between 0 and .4 We apply their algorithm to all CRSP stocks between 2019 and 2021, generating daily measures of net retail buys (buys minus sells), retail volume (buys plus sells), or retail dollar volume (buys×price+sells×price).[8] The retail *share* of dollar volume for any security or portfolio is retail dollar volume divided by total dollar volume. Our RSVOL quintile portfolios are based on this retail share of dollar volume. The securities with some of the highest net retail demand around EIP1 as a share of market capitalization included some large caps, such as American Airlines and other airlines, MGM Resorts, and many small caps such as Soligenix.

Here we document a significant increase in retail trading on the days around EIP check disbursement. We first study the impact of the stimulus payments on the number and dollar volume of retail-initiated trades across the market. Figure 6 plots the time series of retail share

[8] The Boehmer, Jones, Zhang, and Zhang (2021) algorithm, while an excellent approximation, must be treated with some caution because it will identify, for example, trading days with retail buys or sells exceeding the total market capitalization. Where we use the data directly, we winsorize it at the 99% and 1% levels to account for these outliers.

of aggregate trading volume. The dots are daily values, and the solid line is a five trading-day moving average (so an immediate rise will appear to take multiple days to hit its new level).

The figure does suggest spikes in retail trading around EIP checks disbursement dates. Such patterns can be better established using time-series regressions of the form:

$$Retail\ Trading_t = a + b*3\ EIP\ Event\ Days + u_{t,}$$

where *Retail Trading* is one of several time-series measures of market-level retail trading based on weighting stocks' trading activity by their capitalization. *3 EIP Event Days* is an indicator variable that takes a value of 1 in the three-day window [0,+2] upon and following one of the three first actual payment dates. That is, it takes the value 1 for a total of nine days of the sample. Accordingly, the *b* coefficient reflects the increase in trading activity during these windows. The regressions are estimated using daily data from January 2020 through end of May 2021. We include (but the results do not depend on) weekly fixed effects to account for the variability in trading measures that is evident in Figure 6.

Columns 1 through 3 of Table 4 measure trading based on the total number of retail-initiated trades. Column 1 shows that the retail share of value-weighted trading activity is elevated by 0.57% over a baseline level of 6.88%, constituting a statistically significant relative increase of eight percent. Columns 2 and 3 look at the directionality of those retail-initiated trades. Column 2 shows that value-weighted net retail buying ((buys-sells)/total number of trades) is elevated by 0.17% during EIP event days over a baseline of 0.47%, while Column 3 shows that a similar measure, but scaled by the total number of retail-only trades, rises 1.67% over a baseline average of 5.03%. The next three columns repeat the regressions of the first three columns but use dollar volume rather than the number of trades. The results are qualitatively similar. In brief: upon receipt of the first wave of stimulus checks, we observe more retail trading, and a higher fraction of these trades are buys.

A natural but sharper test of volume effects is whether there are spikes in retail-initiated trading volume specifically in retail-favored stocks; that is, among stocks already favored by retail investors, is there a special increase in retail trading?

We address this question using the five portfolios sorted on prior-month retail share of trading volume (RSVOL), extremes of which were plotted in Figure 1, and repeat the analysis from Column 4 of Table 4 for each portfolio. Table 5 reports the results. In line with the aggregate results, we find significant increases across the five portfolios. The boost in the retail share of dollar volume is apparent in each portfolio, but it increases monotonically from Q1 to Q5. The extreme retail portfolio, which has a high baseline share by construction, sees an average increase of 1.68% over the nine EIP event days we consider. The coefficient increase across the portfolios is statistically significant.

In results available on request, we estimated specifications like those in Tables 4 and 5 using a fifteen-day window, rather than a three-day window, to look for elevated retail trading over longer periods. Divakaruni and Zimmerman (2021) find that Bitcoin buy trades for the modal dollar amount of the first CARES Act checks ($1200) stayed high for at least three weeks after the arrival of the first checks and, as Welch's (2021) analysis highlights, it takes a few days to complete a transfer of funds into an online trading account. In our setting, the increased retail trading effect is clearer in windows shorter than fifteen days.

4 Effect of U.S. Stimulus Checks on Stock Prices

4.1 Retail-Biased Portfolios

In addition to our RSVOL portfolios based on estimates of retail order buys and sells from the algorithm of Boehmer et al. (2021), we form portfolios in other ways to isolate stocks that are most likely to be affected by retail investment of stimulus checks.

A second source of data on retail ownership comes from Robinhood, the online investment platform known for pioneering commission-free trades. By mid-2021, Robinhood had over 30 million users and over 18 million active monthly users. The database Robintrack tracked the daily number of owners of individual US-listed stocks and ETFs between 2019 and August 2020. One limitation of these data is that Robinhood stopped providing them in August 2020, making it most useful only for the first round of checks. Another is that it contains only the total number of owners of the security, not daily changes in positions or intensity of trading, which leads to a significant size bias. Our RH portfolios are thus based on the raw number of Robinhood shareholders. With those caveats in mind, the most-Robinhood-owned stocks in the period around the first wave of stimulus checks were Ford, General Electric, Disney, GoPro, and American Airlines.[9]

We also form portfolios based on data from the Financial Industry Regulatory Authority (FINRA). FINRA reports security-week level trading volume of shares traded over-the-counter and not in an Alternative Trading System (ATS).[10] Market participants view such trades, mostly executed by wholesalers such as Citadel or Virtu, as a proxy for retail volume. We normalize this OTC non-ATS trading volume with corresponding weekly share volume from CRSP. The resulting weekly retail trading volume aligns well with the measure based on Boehmer et al. (2021), with a Spearman correlation of .76 in our sample.

[9] See Da, Feng, and Lin (2021) for use of the above two proxies for retail trading in the context of fractional shares.
[10] https://otctransparency.finra.org/otctransparency/OtcData

Our remaining three portfolios are formed on standard characteristics that literature emphasizes as relatively more attractive to U.S. retail investors, such as low nominal share price, low market capitalization, and total return volatility (e.g., Baker and Wurgler (2006), Baker, Greenwood, and Wurgler (2009), Kumar and Lee (2006), and Kumar (2009)). The portfolios CAP and PRC are based on end-of-prior-month values from CRSP, and volatility portfolios SD are based on the standard deviation of daily returns as of the end of the second previous month.[11]

We sort the universe of CRSP stocks with share codes 10 and 11, and exchange codes 1 to 3 into quintile portfolios based the six characteristics (RSVOL, RH, FINRA, CAP, PRC, SD) and examine the performance of equal-weighted high-minus-low portfolios around the check arrivals, except in the case of CAP and PRC, where we examine low-minus-high portfolios. This creates a series of six long-short portfolios designed to highlight the effect of retail investors, and the value-weighted CRSP market return is included for comparison purposes.

4.2 Returns Upon Check Arrival

Table 6 shows portfolio returns around each of the stimulus checks, rounds EIP1, EIP2, and EIP3. Panel A shows long-short returns; Panel B shows abnormal returns of the long leg of the portfolio (i.e., high retail ownership, high volatility, low price, or low market cap). The first trading days on which checks are investable [t=0] are April 13, 2020 (EIP1), December 30, 2020 (EIP2), and March 12, 2021 (EIP3). The first trading day is in the left column. The other columns report cumulative long-short returns over the three-trading-day window [0,+2], the five-

[11] In defining the April 2020 SD portfolios based on February 2020 volatility, this sidesteps the crash of March 2020, in which the stock drops varied dramatically across industries (see Figure 3).

trading-day window [0,+4], and, consistent with Divakaruni and Zimmerman (2021), the fifteen-trading-day window [0,+14].

Except for the market returns in the last row of each panel, all portfolio returns are adjusted for market beta by subtracting the market excess return multiplied by the beta estimated using the sample from the start of 2019 up to 30 trading days before to the respective event window.

We start with EIP1. The aggregate market is down on April 13, 2020, and approximately flat over the three-day period from April 13 through April 15. However, the long-short portfolio formed on retail share of trading volume (RSVOL) sees a large abnormal return on 5.57% on April 13, and a cumulative abnormal return of 10.57% over the three-day window starting with EIP1 check disbursement. Overall, high RSVOL stocks outperform low RSVOL stocks by a wide margin of 14.51% over the fifteen-trading-day window. Similarly, high retail ownership stocks (measured by the Robinhood ownership breadth) rose 3.47% more than low retail ownership stocks on April 13 and continue to grow over the fifteen-trading-day period. The market portfolio, in contrast, is only up by 2.35% over the fifteen-day window. Similar results obtain for the long-short portfolios sorted on the FINRA measure of retail share and on market cap, nominal share price, and return volatility.

Panel B shows that these results are driven by the long side of the portfolio compared to the market. For example, low price stocks experience abnormal returns of 17.77% in the fifteen-day window, compared to 18.35% for the long-short portfolio. Unlike "anomalies" that are driven by the short leg, stronger results on the long side are what we would expect from a pure new-money inflow.

Table 6 also shows the results for EIP2, which was a substantially lower per-check average payment than EIP1, seems to have generated a weaker short-term response but a similar longer-term response. All six long-short portfolios have positive abnormal returns in the three-day announcement window, but only the market cap and nominal price sorted portfolios see statistically significant responses. Note again that the aggregate market portfolio loses value in the three-day event window starting with EIP2 check disbursement.

The returns following EIP2 merit more comment. Over the widest window ending 1/21/2021, cumulative returns resemble those of EIP1. This window just starts to include the beginning of the GameStop (GME) short squeeze: GME had risen from $19.38 to $43.03 between 12/30/2020 and the end of our longest window, but it had quite some distance to go before it hit its intraday peak of $483 on 1/28/2021. Therefore, while the associated frenzy plays only a modest role in our measurements given where our window ends, one might wonder whether the episode would have been less extraordinary without the recent arrival of over 130 million stimulus checks.[12]

There is no evidence of a returns boost around EIP3 check arrivals, on the other hand. This is interesting based on the Census survey results and the spending figures which previous figures demonstrate there was still an immediate boost to consumption spending, One might speculate that the market learned based on the experiences of the first two checks; institutional liquidity to offset market buy orders had been adequately restored; or, based on the economics and psychology of the pandemic at this point, the retail inflows into stocks associated with stimulus checks were less concentrated.

[12] See Jones, Reed, and Waller (2021) for evidence on the role of retail trading in the GameStop episode.

Averaging the events together obscures this potentially revealing time pattern of results, but it is true that across all three events, the long-short portfolios outperformed the market in the event windows around initial EIP disbursement.

4.3 Interpreting Magnitudes

High retail-interest portfolios have risk-adjusted outperformance of approximately 5% over the 4-day windows of EIP1 and EIP2, and approximately flat on EIP3. It is interesting to compare the implied elasticities with prior literature that estimates price impact based on other exogenous events such as stocks entering indexes.[13] Gabaix and Koijen compile estimates from a set of recent papers, suggesting a typical price "multiplier" of about 1, essentially an inverse price elasticity, in which a 1% inflow as a percentage of market capitalization implies a price increase of 1% for individual stocks. Other studies report significantly higher numbers. Chang, Hong, and Liskovich (2015) conclude from their study of Russell Index reconstitutions that the multiplier is approximately 1/0.39 = 2.56. The papers compiled in Wurgler and Zhuravskaya (2002) indicate a still broader range. These responses are hard to pin down, as they vary across stocks, over time with liquidity and attention considerations, and response horizon. In any case, it may nonetheless be interesting to put our results in this context.

In the ideal experiment, we would measure the stimulus dollars into each stock and then compare the price impact over the window in which those dollars were spent (potentially extending the window to see whether the price impact was permanent). Such an analysis is confounded here because retail traders select which stocks to buy. For example, they may

[13] For example, see Shleifer (1986), Harris and Gurel (1986), Lynch and Mendenhall (1997), Kaul, Mehrotra, and Morck (2000), Wurgler and Zhuravskaya (2002), and Greenwood (2005).

purchase stocks that rose at the beginning of the day, giving the positive correlation between daily return and net demand an ambiguous interpretation.

These concerns notwithstanding, we again use the algorithm of Boehmer et al. to measure retail-initiated trades in each stock-day and then link this demand with price changes around the days of the stimulus payments. Specifically, we run regressions of the form

$$R_{i,EIP} = a + b \cdot NetRetail_{i,EIP} + u_{i,EIP},$$

where $R_{i,EIP}$ denotes the [0,+2] three-day return of stock *i* over EIP1, EIP2, or EIP3, and $NetRetail_{i,EIP}$ measures net retail demand (buys minus sells), as a fraction of market capitalization, winsorized at the 1% and 99% levels. The sample includes all 6,600 securities on CRSP and TAQ for which data are available. For EIP1, we estimate a coefficient of 4.40 (t-stat 4.61); for EIP2, a coefficient of 2.49 (t-stat of 3.49); for EIP3, a coefficient of 2.19 (t-stat of 3.43). This implies a multiplier between 2 and 4, in the ballpark of recent estimates.

5. A Second Experiment: The Hong Kong Stimulus Payments

The United States is not the only country with an early Covid-19 response that included direct payments to large fraction of its population as opposed to support targeted to subsets most affected (e.g., self-employed or low-income individuals). Hong Kong, Israel, Japan, Serbia, South Korea, and Singapore also provided broad-based "coronavirus handouts." Among these, Hong Kong's Cash Payout Scheme (CPS) of July 2020 provides the best complement to the U.S. analysis, and in some respects is a simpler experiment.[14] Here we conduct a streamlined version of our U.S. analysis in the Hong Kong setting.

[14] In Japan, the timing of direct payments was spread out across the population due to administrative complications (https://voxeu.org/article/covid-19-stimulus-payments-evidence-japan). In South Korea, direct payments were in the

5.1. Structure and Timing

As detailed in Table 7, the Hong Kong budget proposal released February 26, 2020 provided for direct payments to permanent residents of HK$10,000, or US$1,290. The Legislative Council provided formal funding approval on April 28, 2020. Over 3.5 million payments of this level were electronically transferred on July 6, 2020, another 0.8 million were transferred the next day, and a further 1 million over the next ten days.[15] In contrast to the U.S. payments where we needed spending data to identify when the faucet of stimulus payments was first turned on, Hong Kong made almost all its payments directly into residents' accounts, and more than half of the eventual payments were in a one day dump on July 6.

As in the case of the U.S., the exact fraction of these payments that made their way into the most accessible stock markets, and when they did so, is unknowable. That said, estimates suggest that Hong Kong leads the world in the fraction of adults who actively trade shares.[16] Accordingly, there was speculation that the flow into the market would be meaningful. "What are Hongkongers going to do with their HK$10,000 payout? Bet on the stock market, from the looks of it," read a headline on July 5, 2020, in the *South China Morning Post* (Yiu and Choi 2020). "'I will use it to invest in the stock market at the right time. HK$10,000 is not a large sum of money. My aim is to double it to HK$20,000, which can be more useful,'" said one resident with big plans.

5.2. Effect on Trading

The markets most accessible to Hongkongers are the Hong Kong Stock Exchange and the Shenzhen (SZSE) and Shanghai (SSE) Stock Exchanges. The Hong Kong and mainland

form of vouchers that could be redeemed only at local small businesses (https://ftp.iza.org/dp13567.pdf). In Singapore, the payments were only S$600 (US$430). Israel and Serbia made even smaller payments.

[15] Per government press releases at https://www.cashpayout.gov.hk/eng/press.html.

[16] https://fundselectorasia.com/hong-kong-tops-world-for-retail-share-traders/.

markets are linked in at least two ways. The looser link is that many listed equities share the same fundamentals: A large fraction of HKSE capitalization comes simply from H shares on companies whose A shares are on mainland indices and traditionally restricted to mainland investors. A stronger link is through the relatively new Stock Connect system, which provides for northbound trades and ownership, i.e., from Hong Kong into mainland A shares (as well as southbound trades), and vice-versa. There are limitations on aggregate net flows on any given day, but virtually all major mainland shares, including index constituents, are investable by Hongkongers via this system. Smaller stocks may be excluded, however. Stock Connect has increased cross-market arbitrage (Xu, Zheng, Pan, Xing, Zhang (2020)).

As in the U.S., we begin by looking at trading volume around Hong Kong's check arrival date. Our return and volume data for the Hong Kong market is from the Compustat Global Security database and includes all common shares excluding stocks categorized as investment vehicles.[17] For return and volume data on the two mainland exchanges we use data from the China Stock Market & Accounting Research Database (CSMAR). Table 8 shows that there was an immediate trading increase on July 6, 2020, relative to the prior two trading days in both the Hong Kong and mainland exchanges.

We are not aware of a stock-level measure of retail share we can use along the lines of the Boehmer et al. measure.[18] Instead, we break Hong Kong into five cap quintiles to illustrate that the typical pattern in the cross-section of turnover on the HKSE—the *greater* velocity in larger stocks—was enhanced by the stimulus payments. For example, in Hong Kong's large-cap quintile portfolio, total volume rises from HK$131 billion on the prior trading day to HK$202

[17] We remove stocks with SIC codes starting with 672, as well as those with GICS codes 601010 and 402040.

[18] Nor can we apply the familiar logic from some of our other U.S. cross-sectional portfolios. For example, nominal price is not useful because it is routine for large-cap companies to trade at low nominal prices. The Bank of China's H share is at the equivalent of 36 U.S. cents at the time of this writing, and its A share is at 48 U.S. cents.

billion on July 6. The second panel shows that this represents an increase in daily turnover from 0.507% to 0.749%. The higher turnover numbers for large caps in these markets may be surprising to reachers most familiar with U.S. data.

The increase in turnover was almost as large on the two mainland exchanges, and in absolute magnitude the total increase in trading volume over the prior trading day amounts to around RMB 380 billion, or HK$417 billion, roughly six times larger than that in Hong Kong. Volume remains elevated over pre-check levels for several days beyond what is displayed in the table as the distribution of checks continued. The trading effects here are apparent in market trading volume alone. This contrasts with the U.S. analysis, where one must isolate retail trading to see the pattern.

Day traders can dramatically increase dollar volume, and turnover on these exchanges is high relative to US market norms. Hong Kong has a uniquely broad retail investor base. And volume can beget volume for various reasons, such as when the price of one stock is pushed up by stimulus-payment buying and others are purchased nearly simultaneously by quantitative traders or algorithms to hedge or align valuations. Trend chasing can play a role. Nonetheless, the fact that the volume jump far exceeds the magnitude of the stimulus itself is worth further study.[19] But the qualitative conclusion is not complicated: Some of the stimulus checks, intended as support for Hong Kong's economically hard-hit residents and small businesses, were quickly invested into the nearest stock markets.

5.3. Effect on Prices

[19] This evidence calls to mind Chinco and Sammon's (2021) observation that index-fund trading can account for only a fraction of volume on Russell index reconstitution days.

In parallel with our U.S. analysis, Table 9 shows returns on the Hong Kong cap portfolios and the mainland indexes on day [t=0] and cumulative returns over trading-day windows [0,+2], [0,+4], and [0,+14].

Table 9 shows that Hong Kong and mainland stock prices also rose precisely when the checks arrived, and in the same cross-sectional pattern as trading volume. As suggested by the day 0 results, the Hang Seng Index rose 4% on the first check arrival date. The SSE and SZSE market return, which we construct as a daily rebalanced value-weighted portfolio of all Class A and Class B shares, rose substantially as well. By our construction, these tilt toward mainland large-caps; as mentioned before, many smaller stocks in these markets are in eligible to be bought by northbound investors. Other Asian markets, including Japan, Korea, Singapore, and Indonesia, were flat or up only moderately.

The table also reports returns on the Hong Kong cap portfolios. Portfolios formed in a variety of ways rose, but the cap portfolios show the most revealing long-short contrast. The prices of mid- and large-cap portfolios jump on July 6, the date of the first lump of payments. This jump does not revert over the next two days. This stands in contrast to the U.S. results but is consistent with the prevailing Hong Kong market situation, documented above, in which turnover is greater in large caps.

It is difficult to make a statement about magnitudes in this context because we do not have a good measure of order flow. Total stimulus payments were approximately $4.5 billion compared to a total market capitalization across these three exchanges that is far larger. We are not aware of any estimates of the fraction of stimulus dollars that entered the market. But what we can say is that aggressive estimates—such as assuming that 100% of stimulus dollars entered these markets—imply multipliers that far exceed U.S.-based estimates.

6 Conclusion

The pandemic- and post-pandemic period has been an unusual time in the US stock market. The economy had undergone a massive disruption with no end in sight, and interest rates had fallen to zero. Retail investors, suddenly with plenty of free time, also found it easier than ever to trade on commission-free platforms, and more than a hundred million households received three rounds of stimulus checks of thousands of dollars.

These stimulus checks helped an enormous number of families ride out the pandemic. We investigate whether the arrival of the stimulus checks also had detectable effects on the stock market. They did. It is hard to discern a noteworthy impact on the overall U.S. market, but there are clear impacts on retail trading patterns and stock prices in segments of the stock market favored by retail investors—those with high retail trading, small capitalization, and low nominal share price, for example. We also investigate a similar stimulus payment episode in Hong Kong. It drove a powerful trading and price impact on both the Hong Kong market as well as mainland Chinese markets.

The results also highlight a new and rather undesirable channel for fiscal stimulus. While fiscal policy can impact stocks intendedly through changes in fundamentals—and we showed this clearly for the CARES Act—our evidence suggests that direct payments to individuals may also provide fuel for speculation. The potential for broad-based direct payments to lead to speculation should be an element of future policy discussions.

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Table 1. Selected social media posts about stimulus checks and the stock market. Twitter and Reddit r/WallStreetBets posts around the rounds of stimulus payments that began mid-April 2020, late December 2020, and mid-March 2021.

- April 9, 2020 Just discovered this sub - what stonk do I put my stimulus check into?
- April 14, 2020 Bro everybody buying Tesla stock with their stimulus check lmao
- April 15, 2020 I think I'll invest my stimulus check in some low-risk, high-reward stock
- December 28, 2020 I'm going to invest my stimulus need advice
- December 31, 2020 I just got my stimulus payment. What options should I buy?
- January 7, 2021 Stimulus check out stock goes up; except now this time it really just up 2%, the party is over
- March 11, 2021 $AMC CNBC: Analysts say we could see more than 50% of stimulus checks pumped into the stock market. Meme stocks and blue chip stocks will stand to benefit. #AMC HOLD!
- March 16, 2021 How long does this stimulus check stock overvalue last?
- March 17, 2021 I'm not getting a stimulus check this time around. All I ask is that you invest your stimulus check in the stock market so I can see some gains Specifically #NIO and #DOGE

Table 2. Economic Impact Payments (stimulus checks). Pertinent details of the Acts authorizing the three stimulus checks. Details from the Congressional Research Service (Crandall-Hollick (2021)) and 1040.com (2021). First actual payment date is the first market-open date at which the arrival of impact payments was being actively discussed online and were being spent based on data from Opportunity Insights. Further details in text.

		EIP1: Coronavirus Aid, Relief and Economic Security Act (CARES Act)			EIP2: Consolidated Appropriations Act of 2021			EIP3: American Rescue Plan Act		
Passed Congress		3/27/20			12/21/20			3/10/21		
Signed		3/27/20			12/27/20			3/11/21		
Eligibility		U.S. citizens and resident aliens with a work-eligible SSN and not a dependent.			Those eligible for EIP1 plus taxpayers with work-eligible SSNs.			Same as EIP2		
Direct Payment	Single filers	$1,200			$600			$1,400		
	Joint filers	$2,400			$1,200			$2,800		
	With children under 17	Additional $500 per child			Additional $600 per child			Additional $1400 per dependent		
Eligibility Phaseout Thresholds	Single filers making $75,000+ Joint filers making $150,000+ Household heads with dependents making $112,500+	Any income over the threshold reduces the stimulus payment by 5% of the amount above the threshold. Phaseout thresholds increase $10,000 for each qualifying child.			Same as EIP1, except slightly more aggressive phaseout rates and phaseout thresholds increase by $12,000 per qualifying child.			Same as EIP2, except slightly more aggressive phaseout rates and phaseout thresholds do not change with children.		
First Actual Payment	Reddit, Consumption, Treasury; first market-open date	4/13/20			12/30/20			3/12/21		
First Official Payment	Treasury's announced first payment date	4/15/20			1/4/21			3/17/21		
Cumulative Payments Sent by Type and Approximate Date	Initial Direct Deposits	through 4/17/2020	N = 89 million	$160 billion	through 1/1/21	N = 133 million	$128 billion*	through 3/17/21	N = 90 million	$242 billion
	Direct Deposits + Checks	5/8/20	128 million	$217 billion	2/15/21	147 million	$141 billion	3/24/2021	127 million	$325 billion
	Direct Deposits + Checks	5/22/20	152 million	$258 billion	2/28/21	154 million	$147 billion	3/31/2021	131 million	$335 billion

Cumulative Payments Sent by Type and Approximate Date (continued)	Direct Deposits + Checks	6/5/20	160 million	$270 billion		4/7/2021	156 million	$372 billion
	Direct Deposits + Checks	2/28/21	168 million	$276 billion		4/14/2021	159 million	$376 billion
	Direct Deposits + Checks					4/21/2021	161 million	$379 billion
	Direct Deposits + Checks					4/28/2021	163 million	$384 billion
	Direct Deposits + Checks					5/5/2021	164 million	$386 billion
	Direct Deposits + Checks				* Based on extrapolation from next row	5/12/2021	165 million	$388 billion
	Direct Deposits + Checks					5/26/2021	167 million	$391 billion

Table 3. Household Pulse Surveys. A new, online survey administered by the U.S. Census Bureau as a part of the federal government response to the Coronavirus pandemic. Data collection started on April 23, 2020, less than two weeks after the first EIP checks were sent out.

	EIP1	EIP2	EIP3
Did not receive or did not expect	14.5%	35.3%	35.2%
Used some portion on:			
Food	59.7%	28.1%	28.7%
Household supplies or personal care products	44.4%	16.2%	18.3%
Rent	25.6%	12.5%	12.7%
Mortgage	21.7%	9.5%	10.8%
Utilities	45.3%	21.2%	22.3%
Vehicle payments	21.7%	10.3%	13.4%
Debt payments	19.6%	17.4%	22.4%
Mostly invested or saved it:	**9.3%**	**15.1%**	**18.7%**

Table 4. Regressions to explain retail trading volume. We estimate daily retail-initiated buys and sells for the entire CRSP universe from 2020 to 2021 from TAQ using the Boehmer, Jones, Zhang, and Zhang (2021) methodology. "EIP Event Days" are dummies for nine days: April 13, 2020 and the subsequent two trading days; December 30, 2020 and the subsequent two trading days; March 12, 2021 and the subsequent two trading days. Retail Share is the fraction of total orders classified as retail-initiated. Net denotes net retail buying (buys minus sells), Total denotes all orders, and Retail denotes all retail orders (retail buys plus retail sells). Dollar volume is measured analogously. All specifications include weekly fixed effects. ***, **, and * denote significance at the .1%, 1%, and 5% levels.

	Number of Trades			Dollar Volume		
	Share	Net/Total	Net/Retail	Share	Net/Total	Net/Retail
3 EIP Event Days	0.57***	0.17**	1.67*	0.60**	0.07**	0.85**
	(3.89)	(2.63)	(2.00)	(3.02)	(3.04)	(2.79)
Constant	6.88***	0.47***	5.03***	7.92***	-0.01*	-0.40***
	(319.56)	(60.60)	(56.52)	(289.84)	(-2.40)	(-6.97)
Weekly FE	Yes	Yes	Yes	Yes	Yes	Yes
N	353	353	353	353	353	353
R^2	0.82	0.66	0.64	0.76	0.55	0.64

Table 5. Share of retail-initiated trades on EIP event days. Q1 to Q5 denote five portfolios sorted on retail share of trading volume (RSVOL) in the previous month. Q5 represents the portfolio with the highest share of retail-initiated trades. Within each portfolio we calculate the value-weighted mean of stock-level retail-initiated trade in terms of dollar volumes. "3 EIP Event Days" is a dummy variable capturing the nine days described in Table 4. All specifications include weekly fixed effects. ***, **, and * denote significance at the .1%, 1%, and 5% levels.

	Q1	Q2	Q3	Q4	Q5	Q5-Q1
3 EIP Event Days	0.22*	0.47***	0.58**	0.58*	1.68**	1.47**
	(2.50)	(3.76)	(3.21)	(2.07)	(3.17)	(3.04)
Constant	2.45***	3.70***	5.90***	10.27***	18.64***	16.20***
	(231.91)	(237.97)	(233.26)	(259.22)	(283.04)	(261.73)
Weekly FE	Yes	Yes	Yes	Yes	Yes	Yes
N	353	353	353	353	353	353
R^2	0.67	0.65	0.67	0.70	0.74	0.76

Table 6. Cumulative returns of long-short portfolios around stimulus check arrival. Equal-weighted portfolio returns and value-weighted market returns. Returns are cumulated starting with the leftmost date, e.g., the 4/15/2020 return is the cumulative long-short portfolio return from 4/13/2020 through 4/15/2020. Long-short portfolio returns are adjusted for market beta by subtracting the market excess return multiplied by the beta estimated in the sample from the start of 2019 up to 30 days before the event window. The reported market excess return is also cumulated. The first trading day [t=0] is in the leftmost column. The other columns report the three-trading-day window [0,+2], the five-trading-day window [0,+4], and the fifteen-trading-day window [0,+14]. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Panel A. Long-short portfolios

	[0, 0]	[0, +2]	[0, +4]	[0, +14]
EIP1	**4/13/2020**	**4/15/2020**	**4/17/2020**	**5/1/2020**
RSVOL q5-q1	5.57%***	10.57%***	9.19%***	14.51%***
RH q5-q1	3.47%***	7.57%***	7.15%***	9.98%***
FINRA q5-q1	5.84%***	11.82%***	10.59%***	14.32%***
CAP q1-q5	4.44%***	8.57%***	7.58%***	17.01%***
PRC q1-q5	5.28%***	7.35%***	5.47%***	18.35%***
SD q5-q1	4.96%***	8.50%***	7.40%***	14.69%***
Market Excess Ret.	-0.92%	-0.12%	3.23%	2.35%
EIP2	**12/30/2020**	**1/4/2021**	**1/6/2021**	**1/21/2021**
RSVOL q5-q1	1.05%	1.68%	-0.16%	18.36%***
RH q5-q1	0.96%	1.70%	0.68%	10.44%***
FINRA q5-q1	1.44%	2.88%	1.76%	21.99%***
CAP q1-q5	1.29%	2.92%*	4.15%*	19.95%***
PRC q1-q5	1.47%	4.00%*	5.62%**	22.60%***
SD q5-q1	1.74%	1.15%	4.34%	13.57%***
Market Excess Ret.	0.27%	-0.76%	0.89%	4.32%
EIP3	**3/12/2021**	**3/16/2021**	**3/18/2021**	**4/1/2021**
RSVOL q5-q1	-0.15%	0.50%	0.09%	-4.32%
RH q5-q1	-0.33%	0.12%	-1.64%	-2.18%
FINRA q5-q1	-0.02%	0.68%	0.19%	-3.72%
CAP q1-q5	0.11%	0.08%	0.39%	-4.62%
PRC q1-q5	0.39%	0.06%	0.23%	-5.71%
SD q5-q1	0.29%	-0.76%	-1.66%	-6.80%
Market Excess Ret.	0.10%	0.37%	-1.19%	1.00%

Panel B. Long only portfolios

EIP1	[0, 0] 4/13/2020	[0, +2] 4/15/2020	[0, +4] 4/17/2020	[0, +14] 5/1/2020
RSVOL q5	3.81%***	5.65%***	4.77%***	13.85%***
RH q5	1.40%***	0.93%	0.58%	9.14%***
FINRA q5	3.77%***	5.93%***	5.30%***	13.46%***
CAP q1	3.42%***	6.31%***	5.87%***	16.57%***
PRC q1	4.18%***	5.11%***	4.18%**	17.77%***
SD q5	2.96%***	3.30%**	2.45%	13.50%***
Market Excess Ret.	-0.92%	-0.12%	3.23%	2.35%

EIP2	12/30/2020	1/4/2021	1/6/2021	1/21/2021
RSVOL q5	1.55%	2.19%	4.12%*	20.34%***
RH q5	1.44%	2.45%	4.97%**	13.20%***
FINRA q5	1.88%*	3.38%*	6.01%**	24.46%***
CAP q1	1.69%	3.14%*	5.79%**	21.03%***
PRC q1	1.91%	3.97%*	7.18%**	23.85%***
SD q5	1.91%	1.63%	5.84%**	15.37%***
Market Excess Ret.	0.27%	-0.76%	0.89%	4.32%

EIP3	3/12/2021	3/16/2021	3/18/2021	4/1/2021
RSVOL q5	0.58%	-0.01%	0.30%	-6.08%
RH q5	0.29%	-1.10%	-1.78%	-5.30%
FINRA q5	0.64%	0.04%	0.13%	-5.83%
CAP q1	0.40%	0.19%	0.64%	-4.76%
PRC q1	0.51%	-0.18%	-0.05%	-6.49%
SD q5	0.60%	-0.74%	-0.95%	-7.03%
Market Excess Ret.	0.10%	0.37%	-1.19%	1.00%

Table 7. Cash Payout Scheme in Hong Kong. Details from https://www.scmp.com/news/hong-kong/politics/article/3131401/hong-kong-budget-sails-through-legco-record-time-pro and payment statistics from government press releases at https://www.cashpayout.gov.hk/eng/press.html.

	Cash Payout Scheme (CPS)		
Budget Proposal Released	2/26/20		
Approved	4/28/20		
Eligibility	Hong Kong permanent residents 18 or over		
Direct Payment	HK$10,000 ($1,290 USD)		
First Payment Date	7/6/20		
Cumulative Payments (almost all Direct Deposit)	7/6/20	N=3.5 million	$4.5 billion USD
	7/7/20	4.3 million	$5.5 billion
	7/13/20	4.5 million	$5.8 billion
	7/17/20	5.3 million	$6.8 billion
	7/27/20	5.5 million	$7.1 billion
	8/11/20	5.9 million	$7.6 billion
	11/19/21	6.6 million	$8.5 billion

Table 8. Trading in Hong Kong and mainland Chinese exchanges. Volume figures for cap quintile portfolios in Hong Kong and all stocks in Shanghai (SSE) and Shenzhen (SZSE). The first wave of Hong Kong payments arrived July 6, 2020, so the trading days represented in the columns are t = -2, -1, 0, +1, +2, respectively. HK$1 = RMB 0.91 = $0.13 on July 6, 2020.

	7/2/2020	**7/3/2020**	**7/6/2020**	**7/7/2020**	**7/8/2020**
HK Dollar (HK) or RMB (SSE and SZSE) Volume					
HK CAP q1	52	60	85	138	83
HK CAP q2	169	149	169	203	216
HK CAP q3	808	800	1,180	959	918
HK CAP q4	4,349	4,804	7,589	6,777	5,894
HK CAP q5	144,424	130,993	202,425	190,789	154,297
SSE	445,628	503,568	677,606	737,551	651,453
SZSE	601,860	636,102	841,965	946,249	845,826
Share Turnover					
HK CAP q1	0.24	0.19	0.23	0.34	0.24
HK CAP q2	0.16	0.15	0.15	0.19	0.18
HK CAP q3	0.24	0.22	0.29	0.25	0.24
HK CAP q4	0.29	0.31	0.44	0.41	0.35
HK CAP q5	0.53	0.51	0.75	0.73	0.55
SSE	1.23	1.36	1.75	1.85	1.62
SZSE	2.14	2.24	2.87	3.12	2.77

Table 9. Returns in Hong Kong and mainland Chinese exchanges. Results for equal-weighted cap quintile portfolios in Hong Kong and value-weighted market returns in Shanghai (SSE) and Shenzhen (SZSE). The first wave of Hong Kong payments arrived July 6, 2020 [t=0], so the trading days represented in the columns are t = 0, the three-trading-day window [0,+2], the five-trading-day window [0,+4], and the fifteen-trading-day window [0,+14]. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

	[0, 0]	[0, +2]	[0, +4]	[0, +14]
Returns	**7/6/2020**	**7/8/2020**	**7/10/20200**	**7/24/2020**
HK CAP q1	1.87%**	2.98%*	3.18%	3.01%
HK CAP q2	0.37%	1.50%	2.39%	2.10%
HK CAP q3	2.49%***	2.80%**	3.41%**	3.25%
HK CAP q4	2.61%***	3.01%*	4.03%**	2.14%
HK CAP q5	4.07%***	4.52%**	3.92%	1.11%
HK CAP q5-q1	2.20%**	1.54%	0.73%	-1.90%
SSE	5.80%***	8.09%***	7.70%**	3.09%
SZSE	3.87%**	7.40%**	9.68%**	4.59%

Figure 1. Growth in retail investor accounts and cap portfolios. The top panel shows the number of unique Robinhood user-stock pairs, the number of unique stocks held by Robinhood users, and the number of funded accounts (x2 for scale). The bottom panel shows the value-weighted CRSP portfolio, the top and bottom cap quintile portfolios, the top and bottom retail share quintile portfolios according to the measure by Boehmer, Jones, Zhang, and Zhang (2021), and the assets under Robinhood custody.

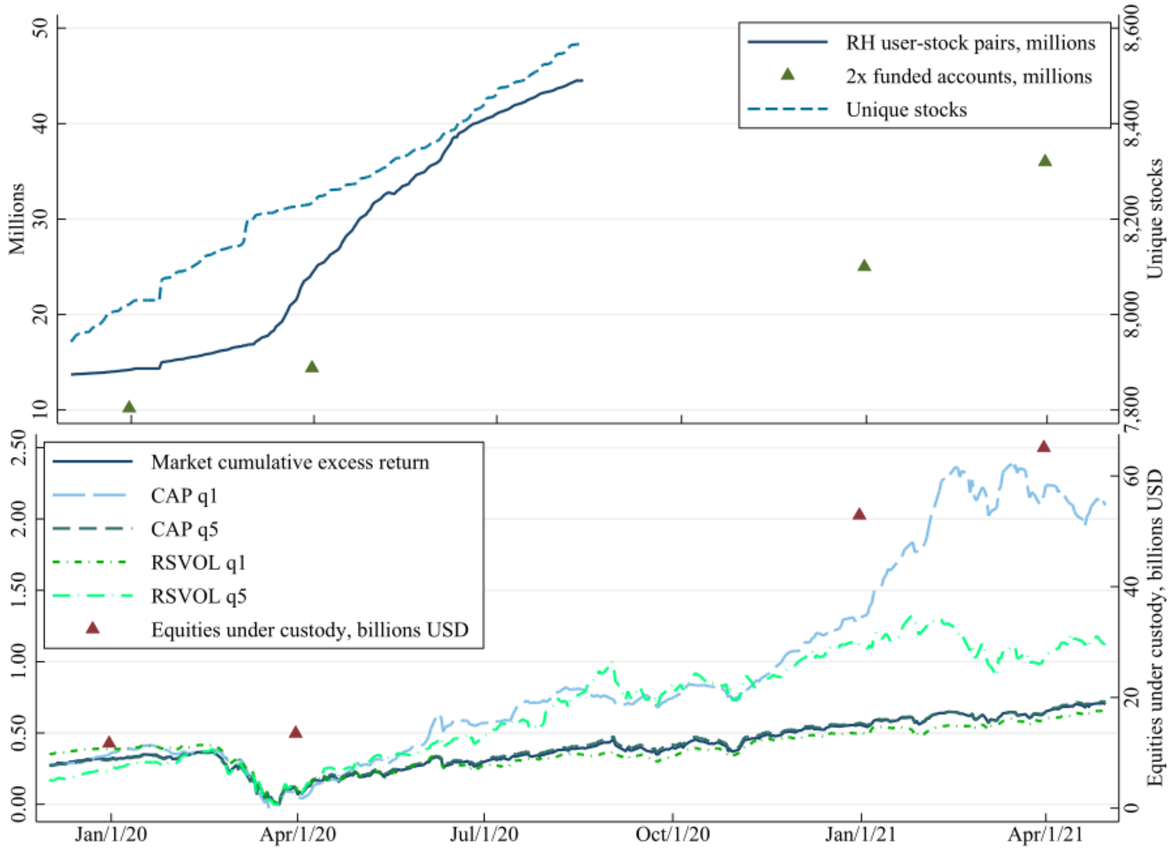

Figure 2. Economic and health context. Top panel shows the number of initial unemployment insurance claims and positive Coronavirus tests. Bottom panel shows indices of aggregate retail spending and time spent away from home. Spending data from consumer credit and debit card data, indexed relative to January 2020. Time away from home estimated using cellphone location data, indexed relative to January 2020. All data from the Opportunity Insights Economic Tracker website.

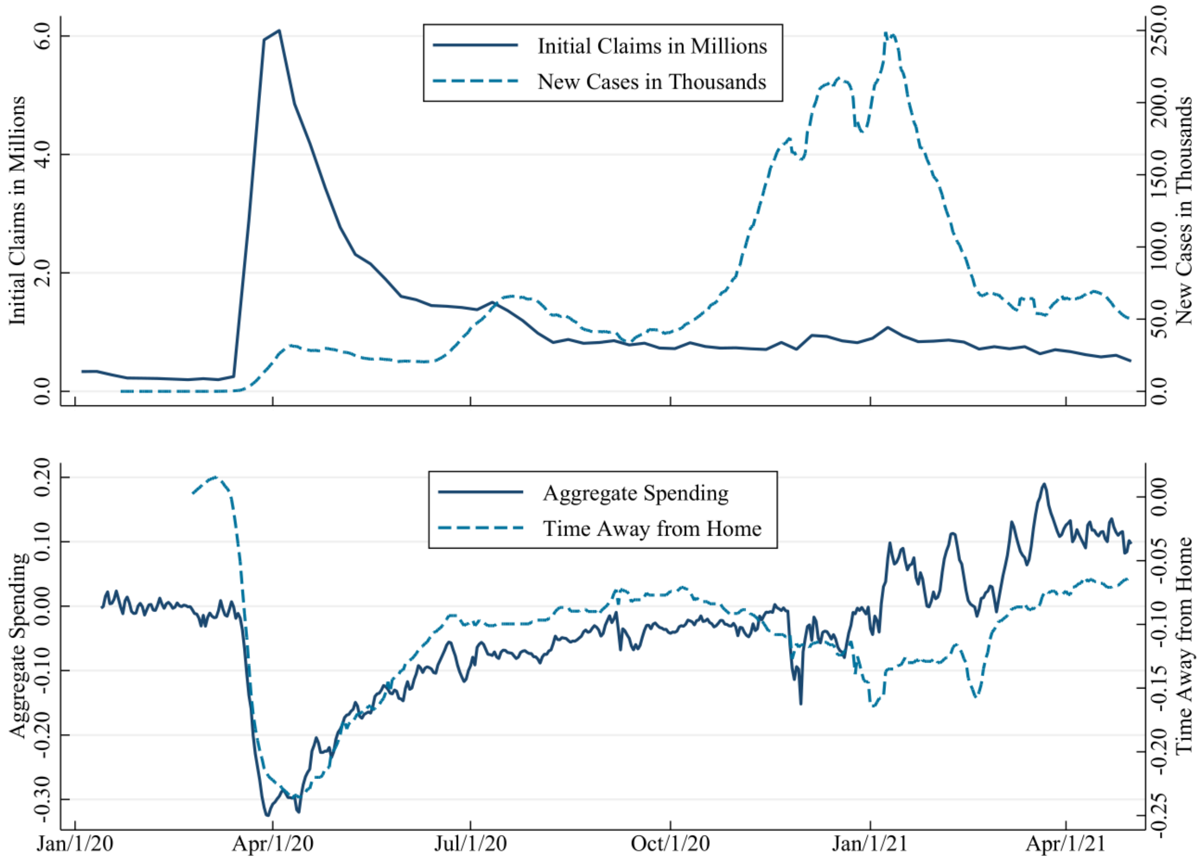

Figure 3. Industry returns around CARES Act passage relative to industry returns around previous crash. Fama-French 49 industry portfolio performance around the passage of the CARES Act (March 24-26, 2020).

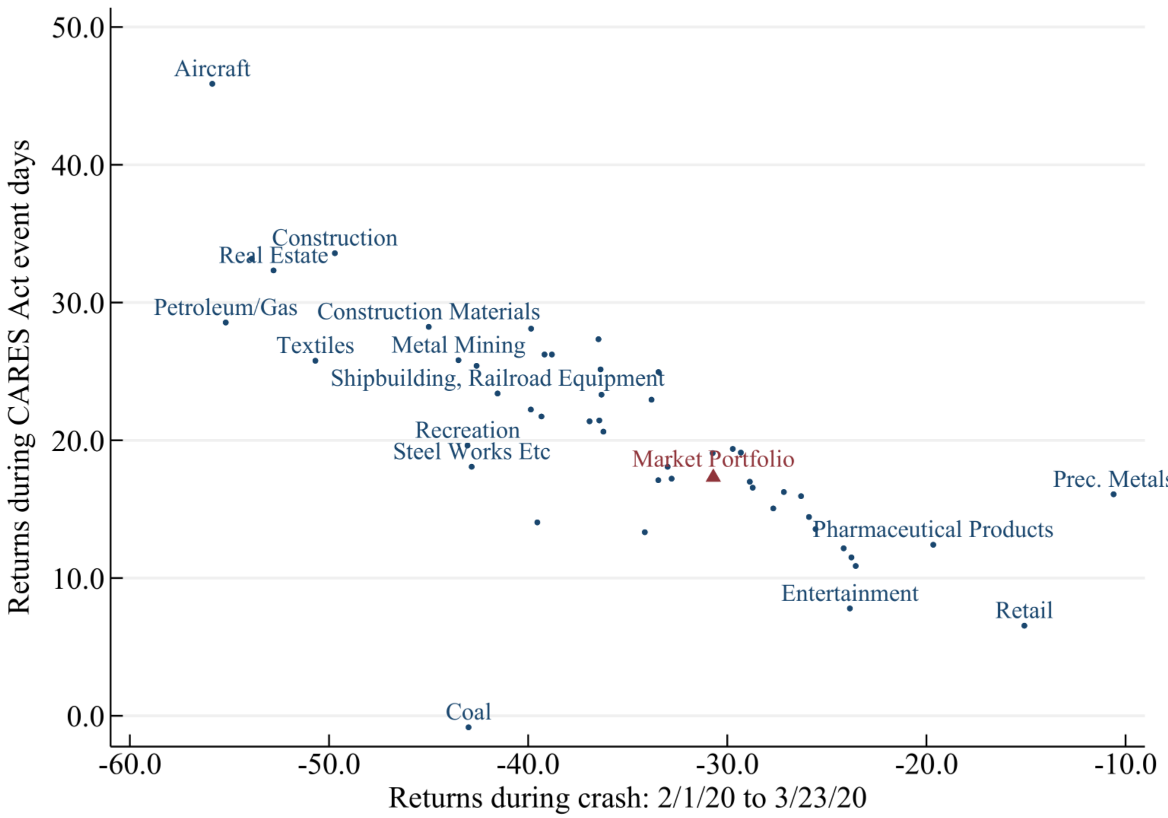

Figure 4. Retail spending around stimulus check arrival. Difference in non-grocery retail spending, low income zip codes minus high income zip codes. The dashed vertical line represents the date of the passage of the authorizing Act. The first solid vertical line denotes the first trading date that checks appear to have been available to a significant number of investors: 4/13/20, 12/30/20, and 3/12/21. The second solid vertical line is the official first payment date.

Figure 5. Social media activity and retail spending in short windows around stimulus check arrival. The first line is the adjudged first trading date that checks appear to have been available to a significant number of investors: 4/13/20, 12/30/20, and 3/12/21. The second line is the official first payment date. Spending from Opportunity Insights' credit card data measures the difference between non-grocery retail spending in low- and high-income ZIP codes. The solid lines show number of posts in the stimulus check subreddit and mentions of "bank account". Days that the stock market was closed are shaded.

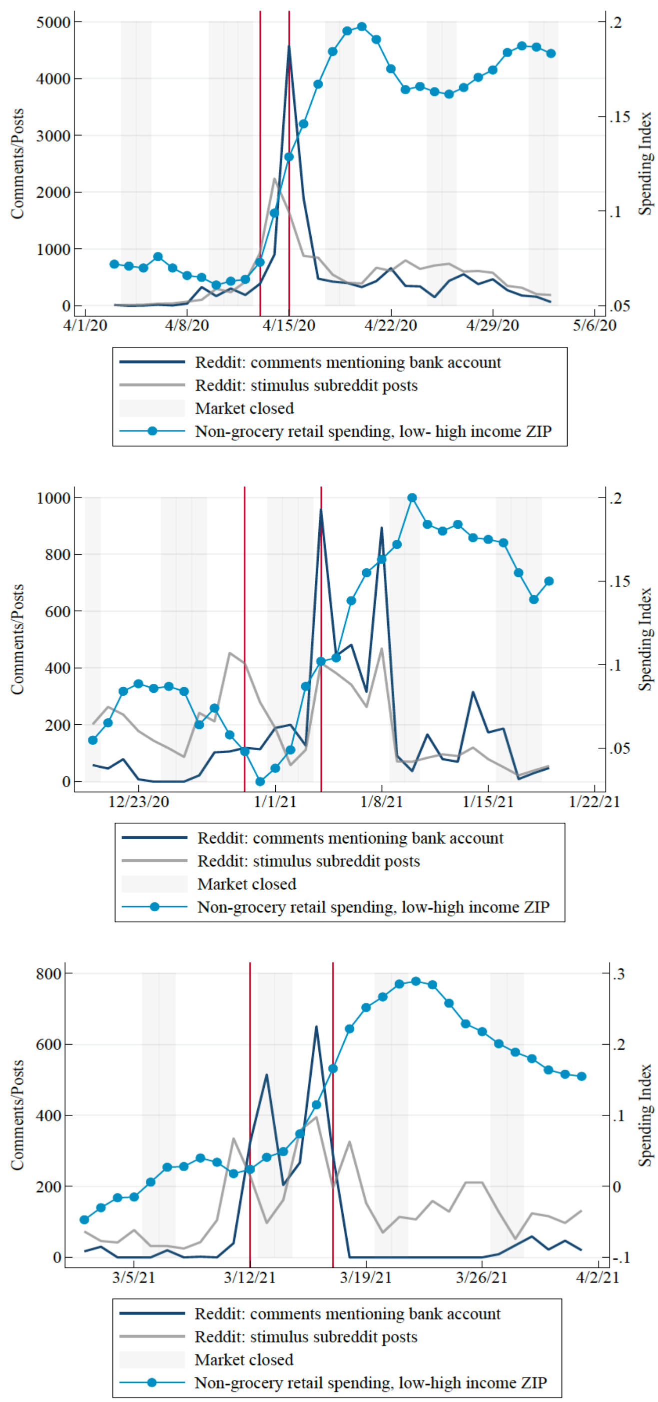

Figure 6. Retail share of trading volume. Retail-initiated trades measured based on the algorithm of Boehmer, Jones, Zhang, and Zhang (2021). Graph shows value-weighted averages of stock-level retail-initiated share volume, as well as the 5-day moving average. The dashed vertical line is when the associated act was signed, the first solid line is the first actual payment date, and the second solid line is the first official payment date.