Do COVID-19 Stimulus Payments Stimulate the Economy?
Evidence from Card Transaction Data in South Korea

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Abstract

We analyze the spending impact of South Korea's COVID-19 stimulus payments, worth up to KRW 1 million (US$887 or €755) per household, using data on card transactions in Seoul. To catalyze the recovery of sales losses during the COVID-19 outbreak for small businesses, the Korean government restricted the use of stimulus payments to be spent in the province of residence, at establishments in pre-specified sectors. We exploit these unique policy rules to study the spending response to the stimulus payments. We find that the stimulus payments discontinuously increased Seoul residents' offline card spending by 21.6% one week after the disbursement, and the positive impact dissipated over the following six weeks in allowed sectors and areas. The implied marginal propensity to consume out of the stimulus payments was 24%. The estimated spending responses to the stimulus payments were weaker in areas with higher average income and more cumulative COVID-19 cases. We also find that the stimulus payments flowed more to the sectors and areas that suffered less during the pandemic.

Keywords: COVID-19 stimulus payments, spending, card transaction data
JEL Codes: D12, E21, H12

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1. Introduction

The novel coronavirus (COVID-19) pandemic of 2019 has caused unprecedented disruptions to the global economy. The global GDP in 2020 is estimated to have dropped by 3.5% with a cumulative loss of US$11 trillion by 2021 (Gopinath, 2020; IMF, 2021a). Several studies have documented the large economic impacts of COVID-19 on a variety of outcomes such as consumer spending, savings, employment, wages, and business revenues (Baker et al., 2020a; Bartik et al., 2020; Béland et al., 2020; Chetty et al., 2020; Coibion et al., 2020b; Kim et al., 2020; Surico et al., 2020). To spur the recovery from this global economic crisis, many governments have announced large-scale fiscal measures such as cash transfers, wage subsidies, rent waivers, expansion of unemployment benefits, and debt payment deferments, nearly US$14 trillion globally as of January 2021 (IMF, 2021b). Of these measures, direct cash transfers to households have been adopted by several countries (e.g., the United States, Japan, South Korea, and Singapore) to boost the economy by encouraging household spending.

In this study, we estimate the spending impact of South Korea's (hereafter Korea) COVID-19 stimulus payments using offline card spending data based on over 4 billion transactions between January 2019 and August 2020 in Seoul.[1] The Korean government implemented a one-off, across-the-board stimulus payment program in mid-May 2020 worth up to KRW 1,000,000 (US$887 or €755) per household.[2] Compared with stimulus payment programs in other countries (e.g., the Coronavirus Aid, Relief, and Economic Security (CARES) Act of 2020 in the United States), the Korean government's stimulus program has unique features to catalyze the recovery of sales losses experienced by small businesses during the COVID-19 outbreak: the stimulus payments must be spent in the province of residence, at establishments in prespecified sectors (e.g., online shopping and large retailers are excluded), by the end of August 2020.

Using a difference-in-differences (DID) model, we present evidence that the stimulus payments discontinuously increased Seoul residents' card spending in Seoul by 21.6% in the week following the disbursement, but the positive spending impact dissipated over the following

[1] The data access is given by the Big Data Campus office of the Seoul metropolitan city government. As a result, we do not have access to transactions occurring outside Seoul among non-Seoul residents. Seoul accounts for almost 20% of Korea's population and over 20% of the national GDP.

[2] As of March 31, 2021, KRW 1,000 is equivalent to US$ 0.887 or € 0.755.

six weeks. Our back-of-the envelope calculation indicates that 24% of the total disbursement to Seoul residents led to an increase in card spending. We also find evidence that both location- and sector- specific rules affect households' spending responses: i) we find little evidence that the payments increased non-Seoul residents' card spending in Seoul and Seoul residents' card spending outside of Seoul, and ii) we document that the stimulus payments increased card spending in allowed sectors, while they did not increase card spending in non-allowed sectors.

Our heterogeneity analysis indicates that the spending response was greater in areas i) where the average household income is lower, and ii) with fewer cumulative COVID-19 cases. The results imply that both households' liquidity constraints and their risk avoidance behavior are likely to have affected the effectiveness of the stimulus payments. We also find that the stimulus payments did not seem to reduce unequal economic losses of the COVID-19 outbreak across business sectors and areas, as the spending responses were larger in sectors and areas less severely affected by the COVID-19 outbreak.

Our study is related to a strand of the literature investigating the spending responses to economic stimulus payments (Agarwal et al., 2007; Johnson et al., 2006; Kaplan and Violante, 2014; Parker et al., 2013; Parker, 2017). For example, Johnson et al. (2006) and Parker et al. (2013) document that tax rebates during the recessions in 2001 and 2008 increased household spending by more than half the amount of the stimulus payments within three months. However, it is difficult to directly apply these findings to the context of the COVID-19 pandemic. First, there could be a trade-off between boosting economic activities via stimulus payments and reducing disease infection risks in the current pandemic-induced recession (Kaplan et al., 2020). Individuals' risk avoidance behavior and social distancing measures can affect the spending responses to COVID-19 stimulus payments. Second, the budgets for the COVID-19 stimulus payments are much larger than those for previous stimulus payments. The budget for the U.S. CARES stimulus payment program was approximately US$300 billion, whereas that for the similar U.S. 2008 tax rebate program was approximately $100 billion. To provide evidence of COVID-19 stimulus payments, Baker et al. (2020b), Chetty et al. (2020, 2021), Misra et al. (2020), and Coibion et al. (2020a) estimate the spending impact of the U.S. CARES Act payments.

Our study contributes to the literature estimating spending responses to stimulus payments in four folds. First, we complement the literature by providing novel evidence on how

spending responses to COVID-19 stimulus payments evolved over a longer time period. Due to the ongoing COVID-19 situation, it is difficult to identify the spending impact of the stimulus payments. To overcome this identification challenge, the existing studies on the CARES Act payments examine immediate (up to two weeks) spending responses by employing an event-study design or a regression discontinuity design that compares spending levels immediately before and after the disbursements (Baker et al., 2020b; Chetty et al., 2020; Misra et al., 2020; Chetty, Friedman, and Stepner, 2021). We study dynamic, longer-term spending responses to COVID-19 stimulus payments by exploiting unique place-based and sector-based policy rules.

Second, there is an ongoing debate about heterogenous spending responses to stimulus payments by income. Parker (2017) finds that income is not only a proxy of liquidity constraints but also captures behavioral traits, such as the lack of financial planning and impatience. Kaplan and Violante (2014) show that propensities to consume out of tax rebates are greater among households holding little liquid wealth despite owning sizable illiquid assets. Chetty et al. (2021) document heterogenous spending responses by income between the two COVID-19 stimulus payments disbursed in April 2020 and January 2021. We add to this unsettled literature that spending responses to COVID-19 stimulus payments in Korea were greater among low-income households, consistent with the standard life-cycle model with borrowing constraints.

Third, we contribute to the literature by studying the spending response to COVID-19 stimulus payments in a setting distinct from the United States. The CARES Act funds were disbursed when COVID-19 was spreading rapidly and when many state governments were imposing stay-at-home orders and business closures. This provides a good setting to examine how strict social distancing measures interact with the stimulus payments. By contrast, Korea responded to the pandemic by relying on citizens' voluntary risk avoidance and never imposed large-scale lockdowns (Shin et al., 2020). This setting represents a valuable opportunity to study the relationship between citizens' risk avoidance behavior in the absence of strict social distancing measures and their spending responses to the stimulus payments.

Lastly, our study contributes to the literature testing the fungibility of income. Beatty et al. (2014) and Hastings and Shapiro (2018) provide evidence that the fungibility of income is rejected in the context of public transfers earmarked for fuel and foods, respectively. The design of Korea's COVID-19 stimulus payment program offers a unique chance to test the fungibility of income. Although the Korean government restricted the usage of the stimulus payments to

prespecified sectors in the province of residence, households can still increase spending in non-allowed locations or sectors if they interchangeably use the stimulus payments and their other incomes. Our results provide novel evidence that the fungibility of income may not hold for the stimulus payments disbursed during recessions.

The rest of the paper is structured as follows. Section 2 describes the background of the COVID-19 stimulus payment program in Korea. We present the data and the empirical strategy in Sections 3 and 4. The results are discussed in Section 5. Section 6 concludes the paper.

2. Background on COVID-19 Stimulus Payments in Korea

The National Assembly passed a law on April 30, 2020 that authorized Korea's first-ever economic stimulus payment program to cushion the negative impact of the COVID-19 outbreak and to boost the economy. A single-member household received a one-off payment of KRW 400,000 (US$355 or €302), and the amount increased by KRW 200,000 (US$177 or €151) with each additional household member, up to KRW 1 million (US$887 or €755) for those with four or more members. Only Korean citizens were eligible to receive the stimulus payments.

There were three different modes of receiving the stimulus payments: 1) cash, 2) a direct deposit to a credit or debit card account, or 3) a gift voucher or a prepaid gift card. Households in which all members were current beneficiaries of public means-tested welfare programs did not need to apply for the program and automatically received the stimulus payments in cash. However, all other households were required to apply for the program and to choose either the second or third option as their preferred payment mode. Subsequently, 12.9%, 66.1% and 21.0% of Korean households (10%, 75.2%, and 14.8% of Seoul residents) received the stimulus payments in cash, a direct deposit to a credit or debit card, or a gift voucher or prepaid gift card, respectively (Ministry of the Interior and Safety, 2020a and 2020b).

The disbursement dates slightly varied by payment modes. Cash disbursements were made on May 4, 2020. Households that opted for a direct deposit to a credit or a debit card account could apply for the stimulus payment online as of May 11, 2020 (the 20th week of the year) and the actual disbursements were made two days after the application. Those that could not apply online or that opted for a gift voucher or a prepaid gift card could receive the payments upon the application from May 18, 2020 onward. By May 25 and June 7, 2020, 95% and 99.5% of eligible households had applied for the payments, respectively.

To assist small businesses and sectors more severely affected by COVID-19 without increasing infection risks, the Korean government restricted the use of stimulus payments. First, the payments must be spent in the province of residence. For example, Seoul residents cannot use their stimulus payments outside of Seoul, and vice versa. Second, the payments must be spent in sectors prespecified by the government. For example, online transactions, department stores, Walmart-like hypermarkets, gyms, hotels and entertainment outlets, such as casinos, bars, pubs and karaoke lounges, were excluded either because these sectors were not affected much by the pandemic or because they involved higher infection risks. Third, the payments must be spent by the end of August, 2020. Otherwise, the remaining amount would be forfeited.[3] These three restrictions were not applicable to households that received the stimulus payments in cash.

3. Data

We use proprietary offline card transaction data from Shinhan Card, the largest credit card company in Korea with a market share of 22%. Shinhan Card collects transaction records from the payment terminal of each store and estimates the total card spending of each block using their proprietary methodology that incorporates additional information, such as the market share of the card company and the card usage patterns based on sector, location, time, and demographic subgroups.[4] It provides estimates of block-level daily total credit and debit card spending in Seoul because the data access is given through the Seoul Metropolitan City Government's Big Data Campus office.[5] The dataset can be also disaggregated by cardholders' residence and sectors of retail establishments. As a result, we have neither block-level card spending data outside Seoul nor individual-level spending data. For the baseline analysis, we construct block- and week-level card transaction data based on 4.33 billion card transactions in Seoul, covering the period from January 2019 to August 2020 and 15,689 blocks.

Figure 1 shows the trends of log-transformed average weekly card spending per block in Seoul between 2019 and 2020 and their difference in panels A and B, respectively. In 2020,

[3] Card spending in a non-restricted sector in the province of residence was automatically first paid by the stimulus payments until the full amount was paid. Any unspent payments received via the card accounts were supposed to be automatically reclaimed by the government after the end of August 2020. However, 99.5% of the disbursed payments were spent before the expiry date (Ministry of the Interior and Safety, 2020a).

[4] A block is the minimum official geographic boundary defined by Statistics Korea. Its average size is less than 0.1 km^2 (0.039 mi^2).

[5] Card transactions represent 63% of the total payment modes (Bank of Korea, 2020).

compared with 2019, there was little change in card spending during the first six weeks of the year.[6] However, card spending sharply reduced from Week 7 onward, when the number of confirmed COVID-19 cases increased exponentially in Seoul. By the time the Korean government managed to contain the COVID-19 outbreak in the 11th week of the year, the free fall in card spending had rebounded. The card spending trend in 2020 reached the pre-pandemic level immediately before the introduction of the stimulus payments. Coinciding with the payment disbursements, card spending sharply increased in Week 21, with the 2020 spending level substantially higher than the 2019 spending level. However, the card spending amount in 2020 gradually reverted to the 2019 level by Week 27.

One limitation of our card spending data is that we do not observe cardholders' cash spending. If an increase in card spending due to the stimulus payments is completely offset by a decrease in cash spending, total household spending would not be affected. To address this limitation, we examine the trend of total household spending using nationally representative, monthly cross-sectional data from the Korean Household Income and Expenditure Survey (KHIES) similar to that of the U.S. Consumer Expenditure Survey. Since the KHIES data do not include geographical identifiers, we cannot restrict the sample to households in Seoul for the comparison. Nevertheless, Figure A1 indicates that the trends of monthly total household spending in 2019 and 2020 calculated by using the KHIES data (Panel A) are similar to the trends of monthly card spending in 2019 and 2020 calculated by our card transaction data (Panel B). This evidence suggests that our card spending data can effectively capture household spending behavior.[7]

4. Empirical Strategy

The primary goal of this public transfer is to boost the virus-stricken economy by encouraging consumers to increase spending. To examine the extent to which the stimulus payments led to an increase in spending, we compare changes in offline card spending between 2019 and 2020 over

[6] A sharp drop in Week 5 is due to the five-day-long Lunar New Year holidays in 2019, longer than in typical years.

[7] Although data from the KHIES provides information on total household spending, they do not provide information on areas and sectors in which households spend their income. Hence, we cannot exploit the policy rules to study the effects of stimulus payments using the KHIES data. As a result, we use proprietary card spending data from Shinhan Card as the primary data source.

weeks using the following generalized DID regression model, commonly adopted in COVID-19 literature:

$$y_{i,t} = \beta_0 + \beta_1 I[Year_t = 2020]_t + \sum_{k \neq 2} \delta_k I[Week_t = k] I[Year_t = 2020] + \phi_i + \omega_t + \epsilon_{i,t} \quad (1)$$

where $y_{i,t}$ is log-transformed card spending of block *i* in week *t* transacted in Seoul. $Year_t$ indicates a calendar year. $Week_t$ denotes the week order within a calendar year. ϕ_i is the block fixed-effect. ω_t is the week fixed-effect. $\epsilon_{i,t}$ is an error term. δ_ks represent the week *k*-specific impact on card spending in 2020 compared with that in 2019, capturing the effects of COVID-19. For statistical inference, we calculated standard errors clustered at the block level, unless specified otherwise.

Since COVID-19 is still raging at the time of writing, δ_ks (k>19) capture effects of the stimulus payments and the direct effects of the pandemic. In Korea, as Figure 1 indicates, card spending had recovered to its pre-pandemic level even before the stimulus payments were made. Thus, we are likely to overestimate the spending impact of stimulus payments if we do not account for this underlying spending trend unrelated to the stimulus payment program.

To overcome this identification challenge, the U.S. studies (Baker et al., 2020b; Chetty et al., 2020 and 2021; Misra et al., 2020) focus on short-term spending response to the CARES Act stimulus payments by assuming a minimal change in the COVID-19 situation immediately before and after the disbursement date. This approach allows them to interpret the changes in the spending trend immediately after the disbursement as the effects of the stimulus payments. We also demonstrate immediate changes in card spending about two weeks before and after May 13, 2020, which is the first date households can receive the stimulus payments to their card account, at the daily frequency in Figure A2. It shows a discontinuous increase in the logarithmic value of card spending on the day of the payment disbursement. The estimated discontinuity is 0.19 with the standard error of 0.062 clustered at the day level. Since there were no discontinuous changes in the COVID-19 situation and other COVID-19 related government policies around the disbursement date, we interpret this increase in card spending as the immediate impact of Korea's COVID-19 stimulus payments.

To provide evidence of a longer-term relationship between card spending and the stimulus payments in our DID framework, we consider changes in card spending unaffected by

the stimulus payments as counterfactual. Since it was an across-the-board program, it is hard to find a group who did not benefit from the payments. To alleviate this issue, we presume that the fungibility of income might not hold, based on several studies rejecting income fungibility, particularly in the context of public transfers (Kooreman, 2000; Beatty et al., 2014; Hastings and Shapiro, 2018). A mental accounts framework (Thaler, 1999) or a theory of rational inattention (Sims, 2003) are possible mechanisms through which people would not increase spending in disallowed locations or sectors.

Since the Korean government restricted the region and sectors in which households can use the stimulus payments, if the stimulus payments are not fungible, then households are less likely to change card spending in non-permitted regions or sectors. This can allow us to use non-Seoul residents' card spending in Seoul as a control group. In addition, we exploit the fact that individuals can spend the stimulus payments only in the prespecified sectors. If the COVID-19 stimulus payments indeed increased card spending, to the extent that the fungibility of income is rejected, the increase in spending will be driven by an increase in spending in the prespecified sectors.

5. Results

Effects of the COVID-19 Stimulus Payments on Card Spending

Figure 2 shows the DID estimates of the effects of the stimulus payments on card spending in Seoul until the 35th week (August 23–29, 2020) with 95% confidence intervals. Black squares represent the estimated weekly spending impacts among Seoul residents.[8] The vertical line indicates the disbursement week of the stimulus payments. The estimates from Week 7 onward indicate that the COVID-19 outbreak sharply reduced card spending regardless of the location of residence. At its bottom, the spending level dropped by approximately 20% in Week 10, which is the peak period of the COVID-19 outbreak in Korea as documented in Figure A3. The negative spending impact began to rebound in Week 11 and almost reached its pre-pandemic level by Week 19. Until the stimulus payment disbursement, spending patterns were generally similar between Seoul and non-Seoul residents. However, the disbursement as of Wednesday in Weeks 20 and 21 resulted in stark differences. Seoul residents' card spending immediately increased by

[8] The regression results for Seoul and non-Seoul residents are reported in Columns (1)–(2) of Table A1.

5.7% in Week 20. In Week 21, when more households received the payments, card spending among Seoul residents surged by 21.6%. Since it is unlikely that the COVID-19 situation discontinuously changed during these two weeks, we argue that the sharp increases in card spending were caused by the disbursement of the stimulus payments as in the existing literature (Baker et al., 2020b; Chetty et al., 2020; Misra et al., 2020). Although the magnitudes became gradually smaller over the course of the following six weeks, the estimates remained positive and statistically significant at the 1% level.

Empty squares represent the estimated changes in non-Seoul residents' card spending in Seoul. They show similar patterns with those of Seoul residents until the disbursement week. However, consistent with the existing empirical evidence of rejecting the fungibility of income (Kooreman, 2000; Beatty et al., 2014; Hastings and Shapiro, 2018), we find little evidence that their card spending in Seoul discontinuously increased after the disbursement week.

We acknowledge that non-Seoul residents' spending in Seoul could have been suppressed due to the stimulus payments because they could spend the payments in their own provinces. Since we do not observe non-Seoul residents' spending in their provinces of residence, we indirectly address this issue by demonstrating if non-Seoul residents decreased spending in allowed sectors relative to non-allowed sectors in Seoul after the disbursements. If non-Seoul residents indeed spend less in Seoul due to the stimulus payments, they could have a stronger incentive to reduce spending in the allowed sectors than in the non-allowed sectors. However, Figure A4 indicates that the spending share varies only up to approximately 1 percentage point after the disbursement of the stimulus payments. In addition, if the usage restriction indeed discouraged non-Seoul residents' overall spending in Seoul, their trips to Seoul are likely to have decreased. However, Figure A5 shows little evidence that the foot traffic of non-Seoul residents in Seoul, based on mobile phone signal data, decreased. Non-Seoul residents' foot traffic reached at the pre-pandemic level before the disbursement week and remained at the similar levels afterward.[9]

To further test if the policy restriction on the location of spending affected households' spending, we investigate the effects of the stimulus payments on card spending of Seoul

[9] Figure A5 indicates that Seoul residents' foot traffic response increased after the disbursement date. It also shows that foot traffic in 2020 further increased during Weeks 28–33 compared with that in 2019. Our close examination indicates that the increase in foot traffic during Weeks 28–33, which coincide with the regular vacation season in Korea, are largely because Seoul residents did not travel outside of Seoul.

residents that occurred outside of Seoul. Unfortunately, our baseline data do not include information on card spending outside Seoul. To overcome this limitation, we use another proprietary dataset on district-level card spending of Seoul residents in Seoul's neighboring provinces (Incheon and Gyeonggi) which account for 31.5% of Korea's total population. Figure A6 plots DID estimates of Seoul residents' spending in Incheon and Gyeonggi. The estimates are generally close to zero and statistically insignificant. The results further provide evidence of rejecting the fungibility of income.[10]

Next, we investigate the effects of COVID-19 stimulus payments on card spending by sector type. Figure 3 plots the DID estimates of the effects of the stimulus payments on card spending in sectors that can and cannot accept stimulus payments in Panels A and B, respectively.[11] Panel A shows similar patterns to those of Figure 2. The effects of COVID-19 on card spending before the disbursements were similar between Seoul and non-Seoul residents. However, once the payments were disbursed, card spending by Seoul residents in the allowed sectors sharply increased in Week 20 with the positive impact persisting over the next six weeks. Conversely, we do not see a similar pattern in card spending among non-Seoul residents. Panel B shows that the disbursements did not change card spending in the non-allowed sectors. The results indicate that the increases in card spending among Seoul residents were mainly driven by increases in card spending in the allowed sectors. Although card spending in the non-allowed sectors was temporarily reduced when the stimulus payments were disbursed, the changes were similar between Seoul and non-Seoul residents.

The results, rejecting the fungibility of income, provide two implications. First, in terms of identification, we can estimate the longer-term effects of COVID-19 stimulus payments on spending using spending changes in non-permitted areas and sectors as counterfactuals. Second, in terms of recipients' welfare, it is uncertain if the stimulus payments significantly worsen households' welfare due to the usage restrictions. The mental accounting framework would predict that those constraints in households' spending can reduce their welfare due to distortions in spending behavior. However, the theory of rational inattention implies that the size of the

[10] Since Seoul residents were not allowed to spend the stimulus payments outside Seoul, the disbursement could discourage spending outside Seoul, thereby dampening overall spending responses. However, Figure A6 shows little evidence that the stimulus payments decreased Seoul residents' spending outside Seoul.

[11] The corresponding regression results are reported in Columns (3)–(6) of Table A1.

welfare losses would be limited. If the welfare loss due to inattention was large, people could have rationally substituted spending between allowed and non-allowed sectors/locations.[12]

Lastly, to conduct an additional falsification check, we exploit the fact that foreign citizens did not receive the stimulus payments. If the spending increase documented in Figure 2 and Panel A of Figure 3 are indeed due to the stimulus payments, we should not observe a similar increase for foreigners' spending in Seoul. We acknowledge large reductions in the number of foreign travelers since the outbreak of COVID-19 due to travel restrictions, which could have changed the composition of foreigners visiting Seoul. However, we presume that the number of foreigners visiting Seoul did not significantly change immediately before and after the date of the disbursements, because there were no policy changes regarding foreign travels. We estimate equation (1) using card spending data of foreigners including tourists using their cards issued from their home countries. Figure A7 plots the DID estimates and shows no increase in card spending among foreigners after the disbursements.

Overall, the results imply that the stimulus payments temporarily boosted the local economy in terms of card spending, with most of the spending responses occurring immediately after the disbursement.[13] To quantify the marginal propensity to consume (MPC) of the COVID-19 stimulus payments, we sum up the DID estimates of Seoul residents from Week 20 through Week 27 in Figure 2. The estimated increase in spending levels is KRW 497.1 billion (US$ 440.9 million). The size of the stimulus payment to Seoul households excluding cash was KRW 2.38 trillion. Although we do not have the information about the disbursement amount to gift vouchers and prepaid cards, this payment mode accounts for 14.2% of households in Seoul. If we assume that the payment amount is identical regardless of payment modes, the total amount of stimulus payments paid out via credit and debit cards would be KRW 2.04 trillion. This suggests that our MPC estimate of Korea's COVID-19 stimulus payments is 24.4%.[14]

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[12] Another possible explanation is that people did not increase spending in non-allowed sectors because their consumption demand could have been already satiated in those sectors. This is consistent with the fact that households deliberately chose not to increase spending in some of those sectors (e.g., hotels, gyms) to reduce the likelihood of spreading COVID-19 (Panel A of Figure 5).

[13] A spending increase observed in Week 31 is likely due to the partial easing of the government restrictions on social gatherings (Ministry of Health and Welfare, 2020). A downward trend observed between Weeks 33 and 35 reflects the second wave of the COVID-19 pandemic, as shown in Figure A3.

[14] On the one hand, the household size could be smaller among those that receive stimulus payments in gift certificates or prepaid cards. Thus, their payment amount could be smaller than those that receive stimulus payments in credit and debit cards. If this is the case, we overestimate the true value of MPC. On the other hand, those that

The area- and sector-based policy rules were not applicable if households received the stimulus payments in cash. Cash recipients are beneficiaries of means-tested welfare programs, and thus they are likely to have a higher value of MPC. However, we cannot observe cash spending in our card transaction data. This limitation could underestimate the spending effects of the stimulus payments of the total population. To examine this issue, we compare changes in total household spending between households receiving means-tested welfare benefits (called the Basic Pension in Korea) and equal-sized low-income households not receiving means-tested welfare benefits, using the KHIES data. Figure A8 shows DID estimates of changes in monthly household spending and indicates little difference in spending responses between the two groups. The results imply that the above-calculated MPC is less likely to be underestimated due to the lack of cash spending data.

To benchmark our finding, we compare our MPC estimate with those in the previous studies. Regarding the stimulus payments via the CARES Act in the United States, Coibion et al. (2020a) reported that individuals spent or plan to spend 42% of the payments based on a household spending survey. Regarding spending responses to tax rebates during previous recessions, Johnson et al. (2006) showed that the 3-month MPC of the 2001 tax rebates was approximately 20–40%, while Parker et al. (2013) reported the 3-month MPC at 50-90% using the 2008 tax rebates program. The size of the MPC in this study is smaller than the MPC estimates of the CARES Act stimulus payments as well as the MPC estimates of the 2001 and 2008 tax rebates.

Roles of Household Income and Risk Avoidance Behavior

To unmask underlying mechanisms behind the effects of the stimulus payments on card spending, we conduct heterogeneity analyses in Figure 4.

First, a standard life-cycle model with borrowing constraints suggests that the spending responses will depend on households' liquidity constraints. In the absence of a direct measure of liquidity constraints, we use the log value of household average monthly income in the district (called *Gu* in Korean) by presuming that those in low-income districts are likely to have tighter

receive stimulus payments in gift certificates or prepaid cards could be financially less sophisticated and have lower incomes and thus have higher values of MPC. If this is the case, we underestimate the true value of MPC.

liquidity constraints.[15] Panel A shows the relationships between the estimated spending responses between Weeks 20 and 27 and the log value of household income. It indicates that the spending response to the stimulus payments are greater in districts with lower average income.[16] The results suggest that households' liquidity constraints are likely to have played a role in determining the effectiveness of stimulus payments.

Second, the current recession induced by COVID-19 is distinct from previous recessions in that individuals are subject to infection risks, limiting their ability to spend the stimulus payments. This feature can dampen spending responses to the stimulus payments. As a proxy for the perceived COVID-19 infection risk, we calculate the district-level number of cumulative COVID-19 cases. Panel B plots DID estimates between Weeks 20 and 27 against the number of cumulative cases across districts in Seoul. This negative association indicates that the effects of stimulus payments were weaker in districts where individuals perceived a higher risk of infection.[17] Figure A9 presents that the results are similar when we use the cumulative number of cases divided by the average daily foot-traffic of each district.

The results of our heterogeneity analysis are consistent with the findings of the existing studies that evaluate the short-term spending impact of stimulus payments via the 2020 CARES Act in the United States (Baker et al., 2020b; Chetty et al., 2020 and 2021; Misra et al., 2020) and have the following implications. First, spending responses could be greater among those with tighter liquidity constraints. Since low-income households are likely to face binding liquidity constraints, means-tested transfers would be more efficient to stimulate household spending than across-the-board payments. Second, the effectiveness of stimulus payments could be neutralized due to risk avoidance behavior and social distancing measures, and thus, it would be more conservative to expect lower MPCs of stimulus payments during the pandemic than those during the previous recessions.

[15] Our card transaction data do not include information on cardholders' household income. We linked the neighborhood-level household income data obtained from the Korea Credit Bureau to our card spending data. The household income data are available at a monthly frequency from October 2018 to December 2019. Thus, we computed the average income of this period.

[16] We also estimate the linear association between household income and spending responses. We calculate heteroskedasticity-robust standard error for statistical inference. The estimated linear association is -0.721 and statistically significant at the 1% level.

[17] The estimated linear association is -0.0078 and statistically significant at the 5% level.

Disequalizing Impact of the COVID-19 Stimulus Payments

The stimulus payments were intended to help businesses that suffered considerable revenue losses during the COVID-19 outbreak. However, the unique nature of the COVID-19-induced recession implies that businesses that suffered the most may not be necessarily the largest beneficiaries of the stimulus payments if consumers continue to shun those businesses (e.g., gyms, hotels, restaurants) due to the infection risk. To understand whether and how much Korea's COVID-19 stimulus payments have helped those affected businesses, we conduct additional heterogeneity analyses in Figure 5.

First, we examine the sector-specific spending impacts of COVID-19 and the stimulus payments in Panel A. We aggregate 63 distinct sectors into 11 categories and show the magnitude of the COVID-19 spending shocks measured by the DID estimates on card spending from Week 8 through Week 19 (pink bars) and the magnitude of the spending impact of the stimulus payments measured by the DID estimates from Week 20 through Week 27 (blue bars) by each category.[18] Vertical bars indicate 95% confidence intervals. We find that sectors related to recreation (e.g., gyms, concerts, theaters), education (e.g., private tuition centers, kindergartens), and travel (e.g., travel agencies, hotels) were hit hardest, but these sectors did not gain from the stimulus payments at all. By contrast, the sectors that remained intact from the pandemic (e.g., furniture, home appliances, and groceries) had gained more than other sectors.

Second, we investigate the area-specific spending impacts of COVID-19 and the stimulus payments. We use the magnitude of the largest estimated spending reduction during the COVID-19 outbreak prior to the stimulus payment disbursements (between Weeks 8 and 19), as a proxy measure of the COVID-19 sales shock. Panel B shows that many of stimulus payments flowed to areas that experienced relatively smaller sales losses during the first wave of COVID-19 before the disbursements.[19] As a robustness check, we use the average of estimated spending reductions between Weeks 8 and 19 as an alternative proxy of the COVID-19 sales shock and find a similar pattern.

The results reported in Figure 5 are consistent with findings of the existing studies estimating spending responses to the U.S. CARES Act payments. For example, Chetty et al. (2020) documented that the spending impact of the CARES Act payments was larger among

[18] Table A2 summarizes the list of merchant categories included in each sector.
[19] The estimated linear association is 0.582 and statistically significant at the 1% level.

sectors which have little physical interactions with customers. Building on those findings, our findings suggest that the COVID-19 stimulus payments did not reduce the gap in economic losses across sectors and areas. The results imply that expanding safety nets such as wage or rent subsidies for sectors or areas most affected by COVID-19 could be a more efficient approach to narrowing gaps in COVID-19-induced economic losses.

6. Conclusion

We analyze the spending responses to COVID-19 stimulus payments using large-scale data on card transactions in Seoul. We find evidence that the stimulus payments increased Seoul residents' card spending in the allowed sectors in Seoul. However, we find little evidence that the stimulus payments increased spending in areas other than the province of residence and non-allowed sectors. Our back-of-the-envelope calculation suggests that 24% of the stimulus payments were used to increase households' spending. The estimated spending response to the stimulus payments were weaker in areas with higher average income and more cumulative COVID-19 cases, suggesting the importance of liquidity constraints and risk avoidance behavior. We find that the stimulus payments flowed more to the sectors and areas that suffered less during the pandemic.

We acknowledge the limitations of this study that can be fruitful avenues for future research. First, our results have limited external generalizability. It may be difficult to apply the findings of our study—spending responses to stimulus checks at the beginning of a historic pandemic—to understand spending responses to the stimulus payments disbursed during other recessions. Second, our evidence provides only partial equilibrium effects. In spite of computational challenges, it would be useful to consider a general equilibrium model accounting for price changes and capital and labor markets in the longer run. Third, our baseline data does not provide complete information on non-Seoul residents' card transactions that occurred outside of Seoul. It would be interesting to examine heterogeneous effects across regions with various economic and demographic characteristics.

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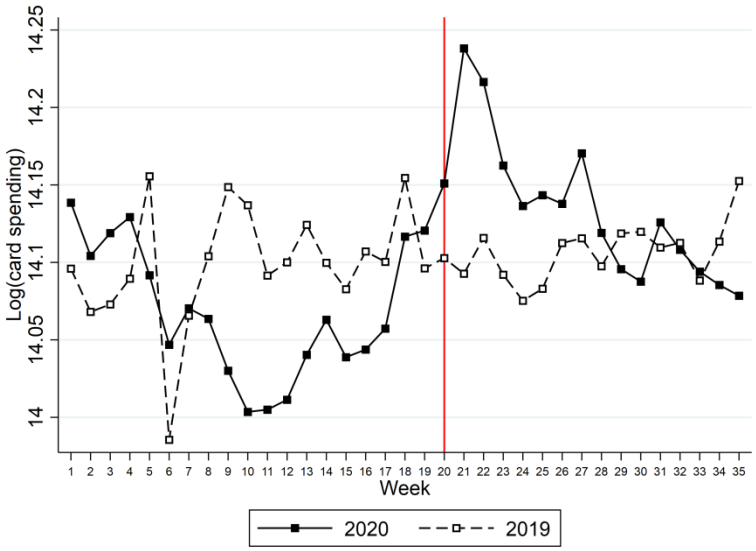
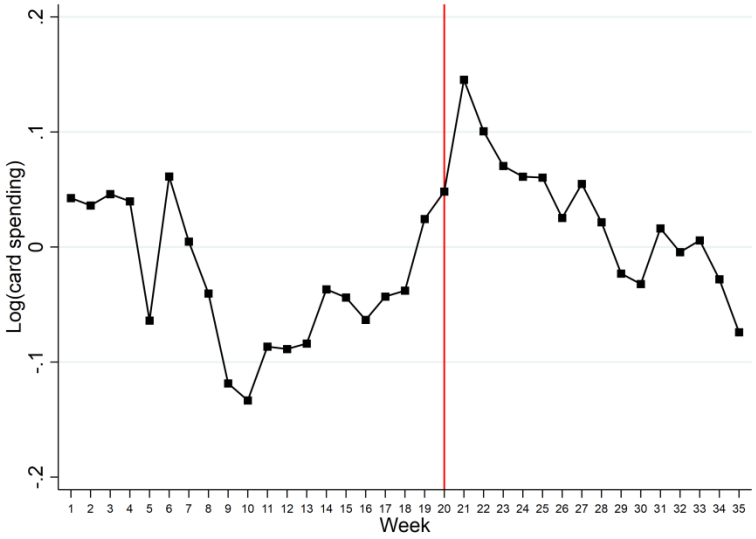
Figures

Figure 1. Weekly trends of log(card spending) in Seoul

A. Average log(card spending) in 2019 and 2020

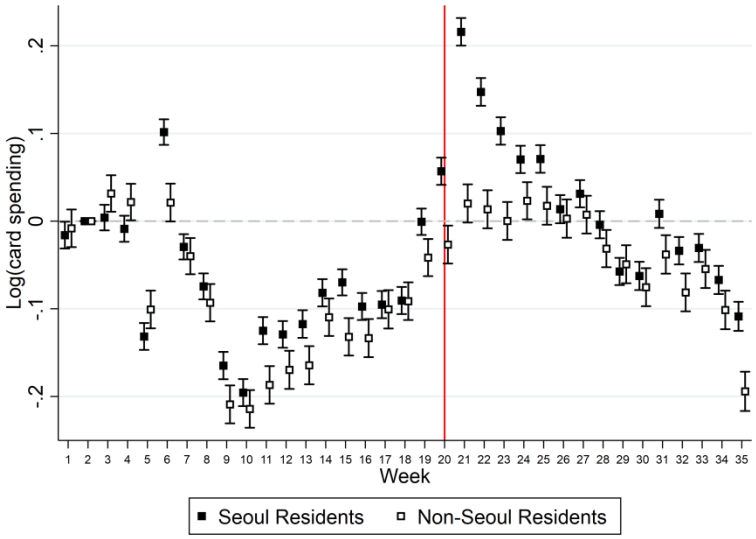


B. Difference in average log(card spending) between 2019 and 2020.



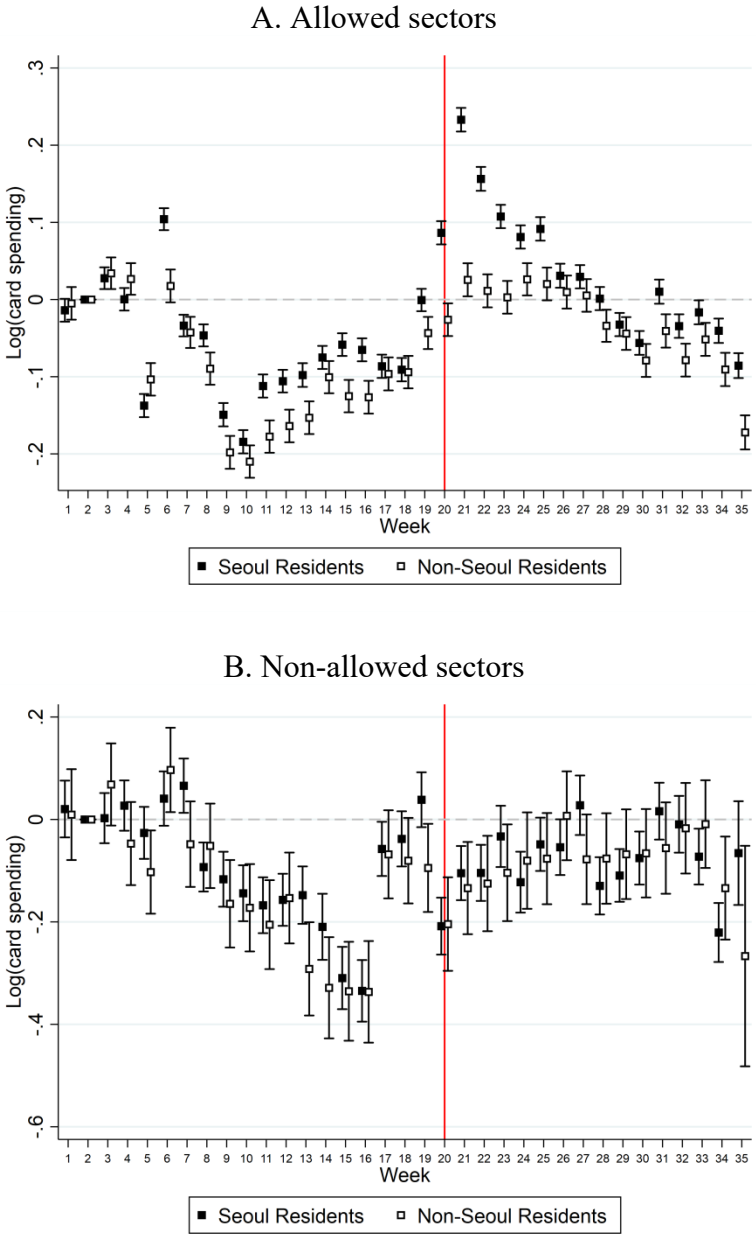
Data source: Offline card transaction data in Seoul from Shinhan Card
Note: The red vertical line represents the disbursement week of the stimulus payments.

Figure 2. DID estimates of the effects of the COVID-19 stimulus payments on log(card spending)



Data source: Offline card transaction data in Seoul from Shinhan Card
Notes. Black and empty squares represent the estimated spending impact of the COVID-19 stimulus payments among Seoul residents and non-Seoul residents using equation (1), respectively. Standard errors are clustered at the block-level. Caps indicate 95% confidence intervals. The red vertical line represents the disbursement week of the stimulus payments.

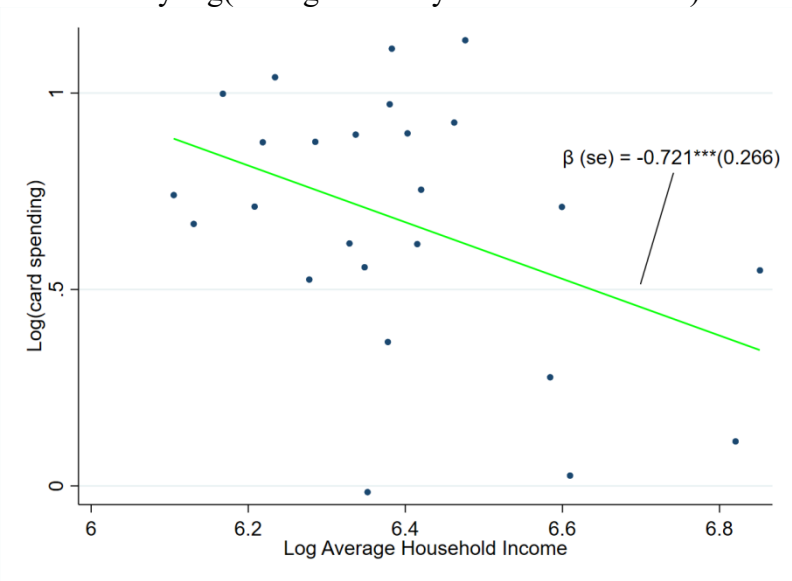
Figure 3. DID estimates of the effects of the COVID-19 stimulus payments on log(card spending)
Allowed sectors vs. Non-allowed sectors



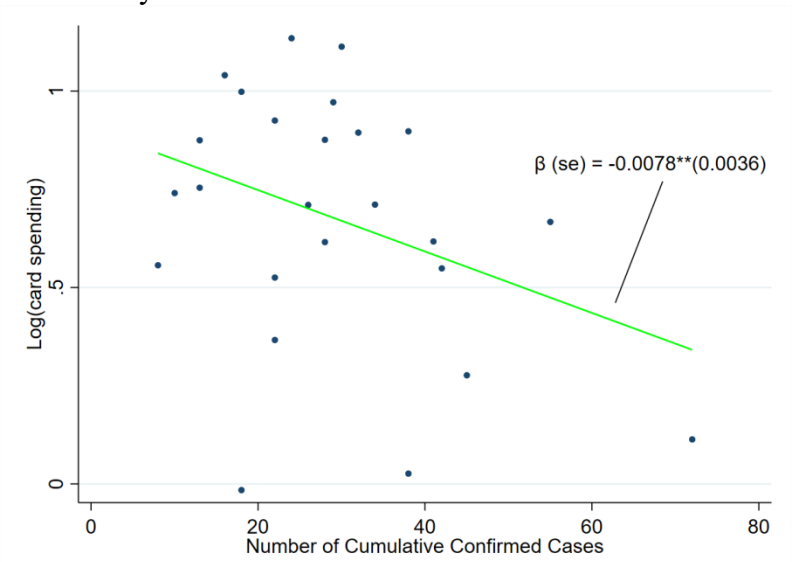
Data source: Offline card transaction data in Seoul from Shinhan Card
Notes. Black and empty squares represent the estimated spending impact of the COVID-19 stimulus payments among Seoul residents and non-Seoul residents using equation (1), respectively. Standard errors are clustered at the block-level. Caps indicate 95% confidence intervals. The red vertical line represents the disbursement week of the stimulus payments.

Figure 4. Heterogeneous effects of the COVID-19 stimulus payments

A. By log(average monthly household income)



B. By the number of cumulative confirmed cases

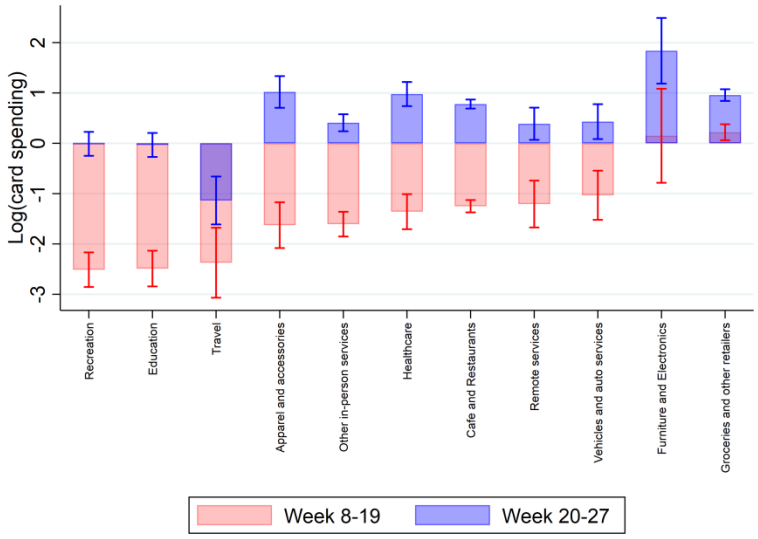


Data source: Offline card transaction data from Shinhan Card, Korea Credit Bureau's district-level household income data (for panel A), and district-level COVID-19 confirmed cases data from the Ministry of Health and Welfare (panel B)

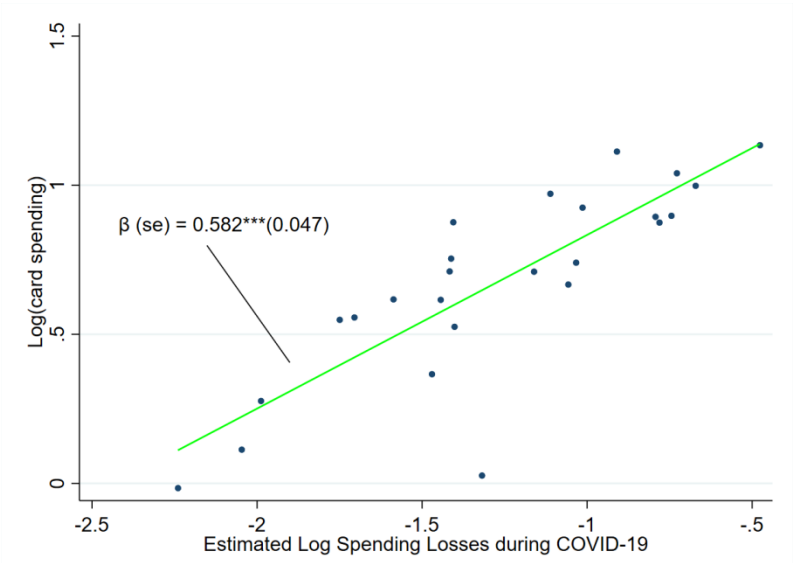
Notes. We re-estimate the effects of the stimulus payments on card spending in each district in panels A and B. We plot the sum of DID estimates between Week 20 and 27 against the log of average monthly household income and the cumulative number of confirmed cases in panels A and B, respectively. We estimate linear associations by using the ordinary least squares. For statistical inference, we calculate heteroskedasticity-robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 5. Spending responses to the COVID-19 stimulus payments by the size of economic losses during the COVID-19 outbreak

A. Across sectors



B. Across districts



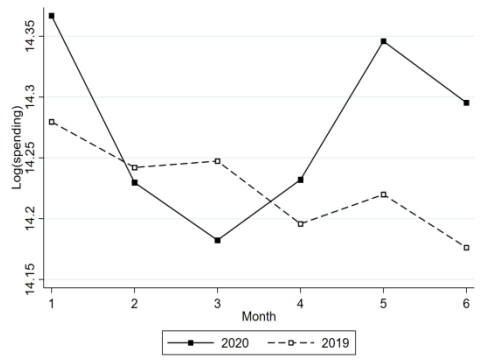
Data source: Offline card transaction data from Shinhan Card

Notes. We estimate the effects of the stimulus payments for each sector in panel A and for each district in panel B. In addition, we estimate the effects of COVID-19 on each sector in panel A. We plot the sum of DID estimates between Weeks 20 and 27 against log-transformed average monthly household income and the largest economic loss in panel B. We plot the sum of DID estimates between Weeks 20 and 27 (blue bars) and between Week 8 and 19 (red bars) along with 95% confidence intervals in panel A. In panel B. we estimate linear associations by using the ordinary least squares. For statistical inference, we calculate heteroskedasticity-robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

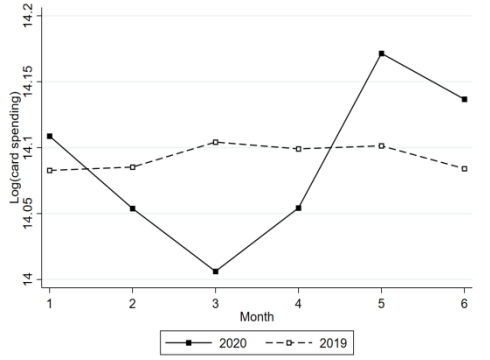
Appendix Figures Tables

Figure A1. Monthly trends of average spending in 2019 and 2020

A. Trends of log(total consumption spending)

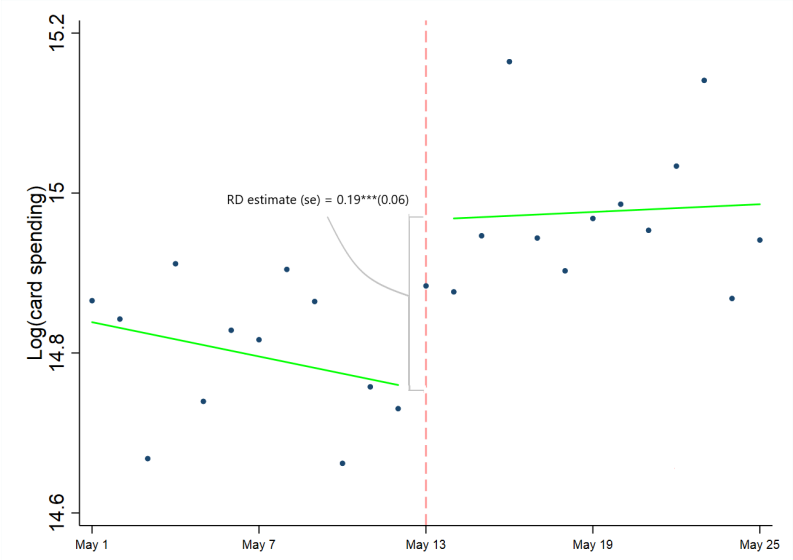


B. Trends of log(card spending) in Seoul



Data sources: The Korean Household Income and Expenditure Survey and Offline card transaction data in Seoul from Shinhan Card for Panels A and B, respectively.

Figure A2. Daily log(card spending) in May, 2020



Data source: Offline card transaction data in Seoul from Shinhan Card
Notes: RD estimate captures the discontinuity in log(card spending) on the day of the stimulus payment disbursement. Standard errors are clustered at the calendar day level. The red vertical line represents the disbursement date.

Figure A3. Trend of COVID-19 confirmed cases in South Korea

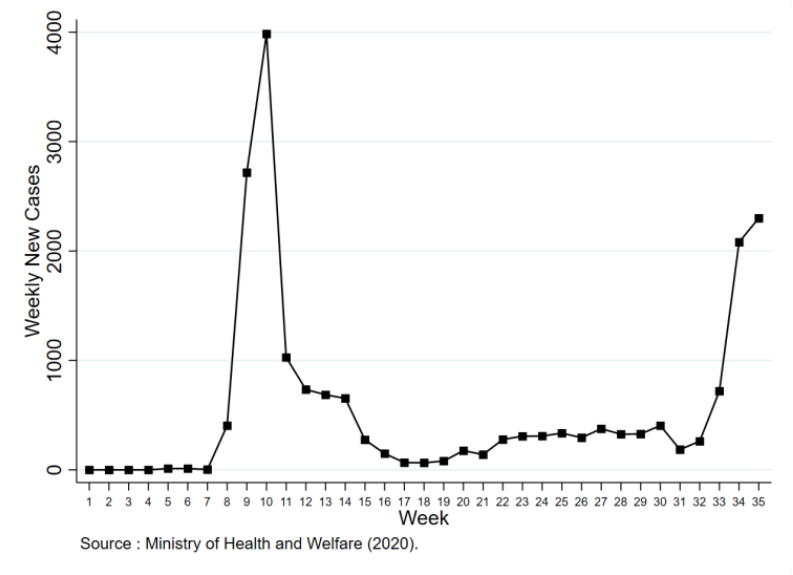
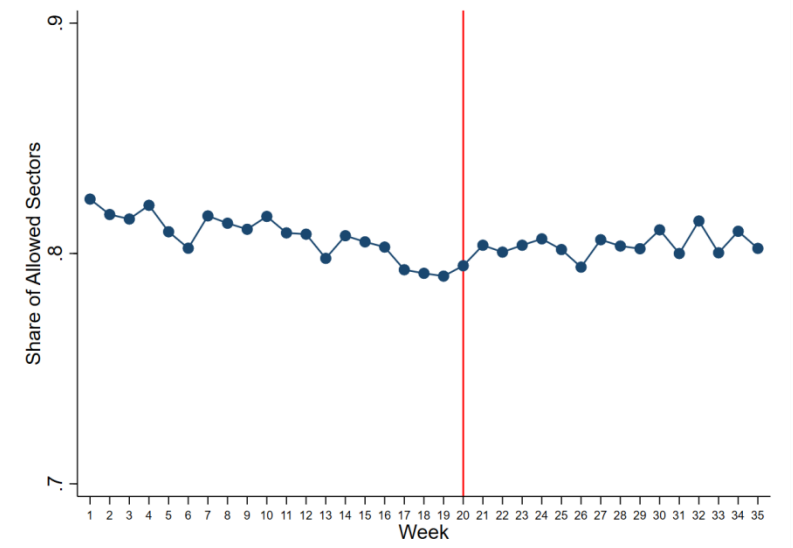
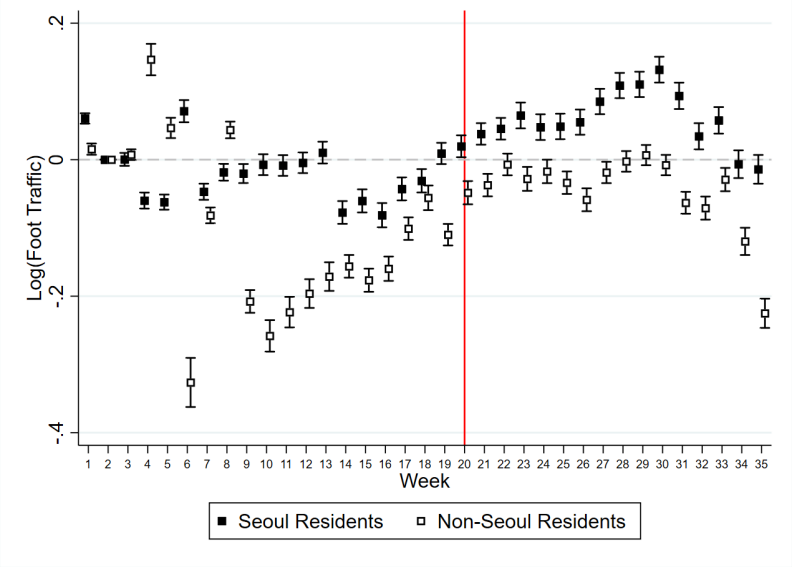


Figure A4. Trend of the share of card spending in the allowed sectors by non-Seoul residents



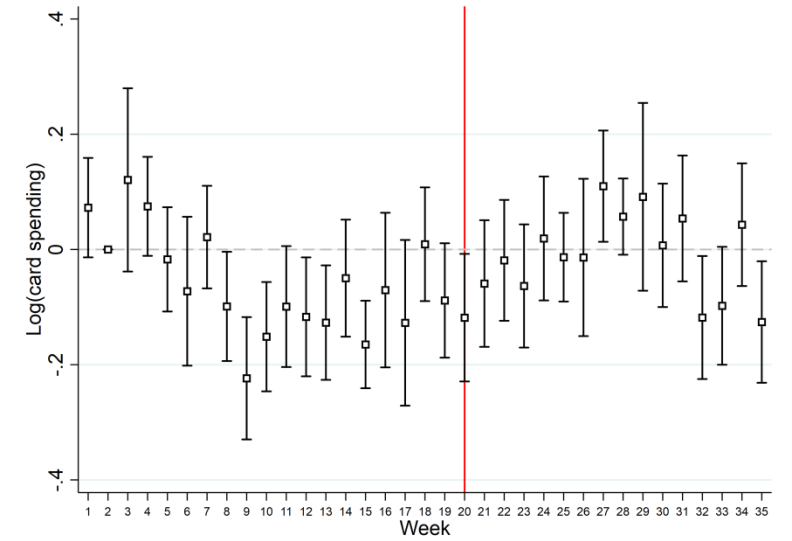
Data source: Offline card transaction data from Shinhan Card
Note: The red vertical line represents the disbursement week of the stimulus payments.

Figure A5. DID estimates of the effects of the COVID-19 stimulus payments on log(foot traffic)



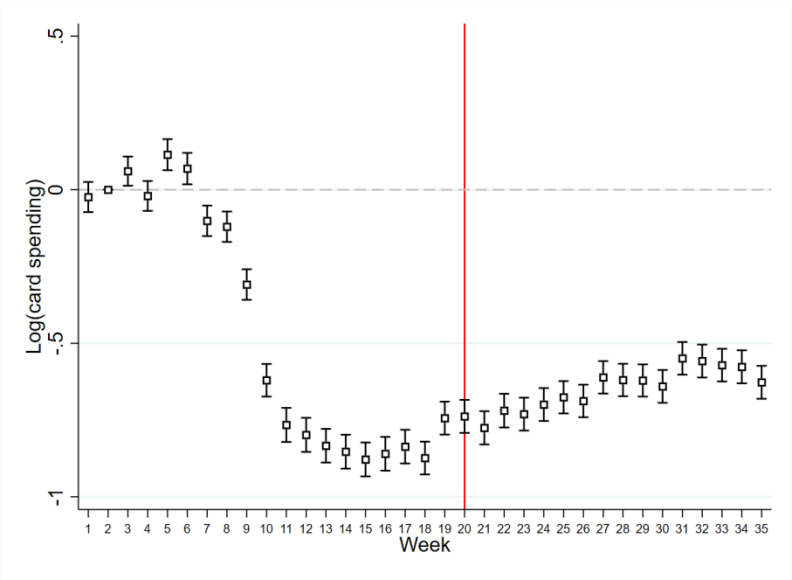
Data source: foot traffic data from KT
Notes: Black and empty squares represent the estimated impact of the COVID-19 stimulus payments on Seoul residents and non-Seoul residents' neighborhood-level foot traffic in Seoul using equation (1), respectively. We compute the daily foot traffic by using the hourly estimates of the number of individuals physically present in a neighborhood based on mobile phone signals. We use the proprietary foot traffic data provided by the KT, the second-largest mobile telecom carrier in Korea. Seoul residents are defined as those who stayed in Seoul longer than 4 hours between 12am and 6am for at least 14 days in the previous month. Standard errors are clustered at the neighborhood-level. Caps indicate 95% confidence intervals. The red vertical line represents the disbursement week of the stimulus payments.

Figure A6. DID estimates of the effects of COVID-19 stimulus payments on log(card spending that occurred outside Seoul) by Seoul residents



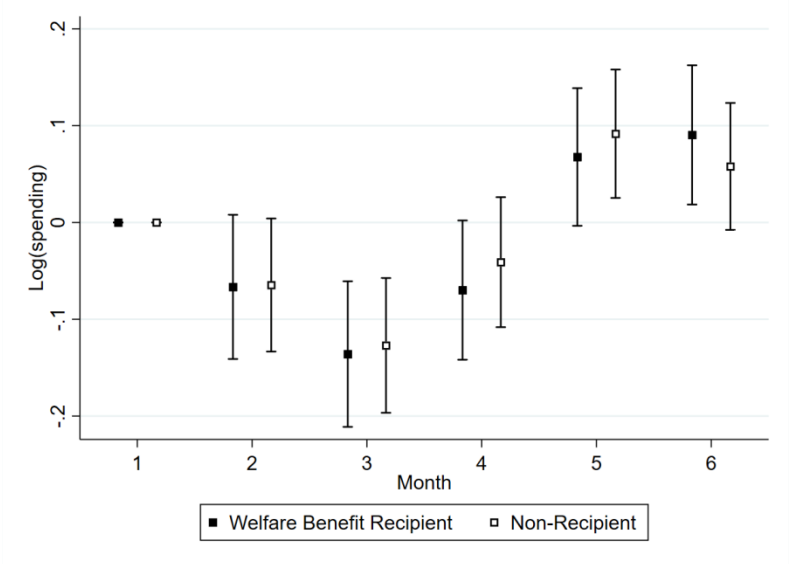
Data source: Offline card transaction data from Shinhan Card
Notes. Empty squares represent the estimated impact of the COVID-19 stimulus payments on card spending that occurred outside Seoul by Seoul residents using equation (1). Standard errors are clustered at the district-level and the data are restricted to Incheon and Gyungi-do. Caps indicate 95% confidence intervals. The red vertical line represents the disbursement week of the stimulus payments.

Figure A7. DID estimates of the effects of the COVID-19 stimulus payments on foreigners' log(card spending)



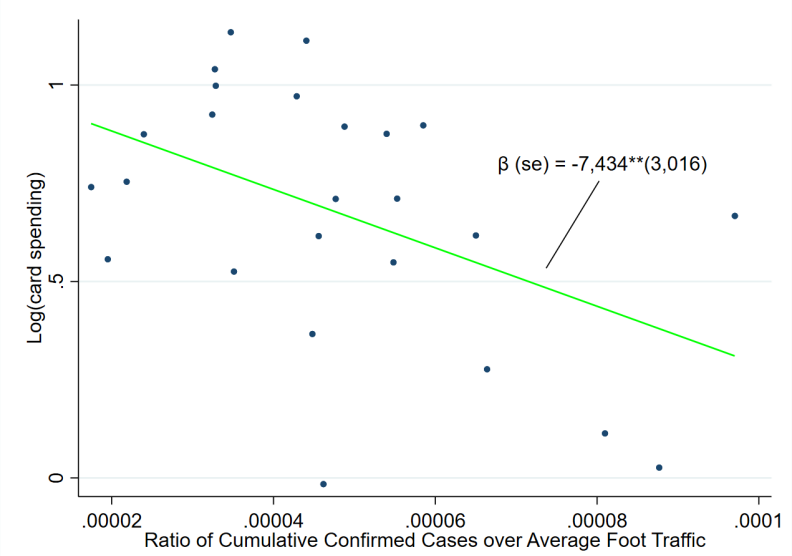
Data source: Offline card transaction data from Shinhan Card
Notes. Black squares represent the estimated spending impact of the COVID-19 stimulus payments among foreigners using equation (1). Standard errors are clustered at the block-level. Caps indicate 95% confidence intervals. The red vertical line represents the disbursement week of the stimulus payments.

Figure A8. DID estimates of the effects of COVID-19 stimulus payments on log(household total spending) by households' welfare benefit receipt status



Data source: The Korean Household Income and Expenditure Survey
Notes: Black squares represent the estimated spending impact of COVID-19 stimulus payments among households receiving means-tested welfare benefits. Empty squares represent the estimated spending impact of COVID-19 stimulus payments among equal-sized low-income households that do not receive means-tested welfare benefits. Caps indicate 95% confidence intervals using heteroskedasticity-robust standard errors.

Figure A9. Heterogeneous effects of the COVID-19 stimulus payments by ratio of cumulative confirmed cases over average foot traffic



Data source: Offline card transaction data from Shinhan Card, Foot traffic data from KT, and COVID-19 case statistics from the Ministry of Health and Welfare

Notes. We estimate the effects of the COVID-19 stimulus payments for each district. We plot the sum of DID estimates between Week 20 and 27 against the ratio of the number of cumulative confirmed COVID-19 cases over the average foot traffic. The number of cumulative COVID-19 cases is only available at the district level. We estimate a linear association by using the ordinary least squares. For statistical inference, we calculate heteroskedasticity-robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A1. DID estimates of the effects of the COVID-19 stimulus payments

Dependent variable: Log(card spending)						
	Overall		Allowed sector		Non-allowed sector	
	Seoul Residents	Non-Seoul Residents	Seoul Residents	Non-Seoul Residents	Seoul Residents	Non-Seoul Residents
	(1)	(2)	(3)	(4)	(5)	(6)
A. Weekly spending responses						
Week 20	0.057***	-0.027**	0.087***	-0.026**	-0.208***	-0.204***
	(0.008)	(0.011)	(0.008)	(0.011)	(0.028)	(0.047)
Week 21	0.216***	0.020*	0.233***	0.026**	-0.105***	-0.134***
	(0.008)	(0.011)	(0.008)	(0.011)	(0.027)	(0.046)
Week 22	0.147***	0.014	0.156***	0.011	-0.104***	-0.125***
	(0.008)	(0.011)	(0.008)	(0.011)	(0.028)	(0.048)
Week 23	0.103***	0.0002	0.108***	0.003	-0.033	-0.104**
	(0.008)	(0.011)	(0.008)	(0.011)	(0.031)	(0.048)
Week 24	0.070***	0.023**	0.081***	0.026**	-0.122***	-0.080*
	(0.008)	(0.011)	(0.008)	(0.011)	(0.030)	(0.048)
Week 25	0.071***	0.018	0.092***	0.020*	-0.049*	-0.077*
	(0.008)	(0.011)	(0.008)	(0.011)	(0.027)	(0.045)
Week 26	0.014*	0.003	0.031***	0.010	-0.054*	0.007
	(0.008)	(0.011)	(0.008)	(0.011)	(0.028)	(0.044)
Week 27	0.031***	0.007	0.030***	0.005	0.028	-0.078*
	(0.008)	(0.011)	(0.008)	(0.011)	(0.030)	(0.045)
B. Total card spending amounts in Seoul, week 20 to 27: KRW 497.1 billion						
C. Stimulus payments paid out via credit and debit cards: KRW 2.04 trillion						
D. Implied MPC: 24.4%						

Data source: Offline card transaction data in Seoul from Shinhan Card

Notes. Standard errors are clustered at the block-level. ***, **, and *denote p-value is less than 1, 5, 10 percent, respectively.

Table A2. Categorization of sectors

Sector	Merchant categories
Apparel and Accessories	boutiques, casual clothing stores, and watch shops
Cafe and Restaurants	cafes, restaurants, and bakeries
Education	private tuition centers, kindergartens, education stationery stores
Furniture and Electronics	furniture stores, home appliances and other electronics stores
Groceries and other Retailers	groceries, supermarkets, convenience stores, and department stores
Healthcare	hospitals, drugstores, and postpartum care centers
Other in-person services	beauty salons, spas, and public baths
Recreation	karaoke lounges, pubs, bars, gyms, concerts, theaters, swimming pools, other leisure activities and equipment
Remote services	legal services, delivery, repair services, wedding planning, consulting services, and other services
Travel and vacations	travel agencies, hotels, and other travel-related services
Vehicles and Automotive	car dealerships, automobile parts, gas stations, parking services, and auto repair services