Spending Impact of COVID-19 Stimulus Payments: Evidence from Card Transaction Data in South Korea

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Abstract

We analyze the impact of South Korea's one-off COVID-19 stimulus payments on spending using high-frequency, offline card transactions data based on 3.42 billion transactions in Seoul. The Korean stimulus payment policy is distinct because the government mandated the payments to be used only in the province of residence and in the pre-specified sectors (e.g., excluding online transactions and large retailers). We find evidence that the stimulus payments increased card spending in Seoul. Consistent with the spending restrictions, the policy impact is driven by Seoul residents and the sectors allowed by the government. The spending response to the stimulus payments are weaker in areas with higher average income and more cumulative COVID-19 cases, suggesting the importance of liquidity constraints and risk avoidance. Our back-of-the-envelope calculation suggests that households spend 29% of stimulus payments in the first six weeks. We also find that the stimulus payments flowed more to the sectors and areas suffered less during the pandemic, making the economic impact of COVID-19 more unequal.

Keywords: COVID-19, pandemic, stimulus payments, card transaction data, difference-in-differences
JEL Codes: D12, E21, H12

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1. Introduction

The novel coronavirus of 2019 (COVID-19) pandemic has disrupted the global economy to an unprecedented level. The global GDP in 2020 is estimated to drop by 4.9% with a cumulative loss of $12.5 trillion by 2021 (Gopinath, 2020; IMF, 2020). Several studies have documented large economic impacts of COVID-19 on a variety of outcomes such as consumer spending, saving, employment, wages, and businesses revenues (Baker et al., 2020; 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 overcome this global economic crisis and spur the recovery, many governments have implemented large-scale fiscal measures such as cash transfers, wage subsidies, rent waiver, expansion of unemployment benefits and other social programs, and debt payment deferment, with the announced amount of more than $10 trillion globally as of June 2020 (IMF, 2020). Of these measures, direct cash transfers have been adopted by several countries (e.g., the United States, Japan, South Korea, and Singapore), as a means to boost the economy by encouraging consumption spending.

In this study, we estimate the spending impact of Korea's COVID-19 stimulus payments using offline card spending data based on 3.42 billion transactions between January 2019 and June 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$861 or €726) per household.[2] Compared with stimulus payment programs in other countries (e.g., the CARES payments in the United States), the Korean government's stimulus program has unique features to catalyze the recovery of sales losses during COVID-19. The stimulus payments must only be spent in the province of residence, at establishments allowed by the government (excluding online shopping, large retailers, etc), by August 2020.

To identify the spending response to Korea's COVID-19 stimulus payments, we first apply a difference-in-differences (DID) approach by comparing differences of card spending in 2020 against those in 2019 over the period before and after the payment disbursement. Then, we compare the DID estimates between Seoul and non-Seoul residents because non-Seoul residents

[1] We have access to card transaction data that occurred only in Seoul. Thus, our analysis is restricted to the spending response in Seoul. Seoul accounts for almost 20% of Korea's population over 20% of national GDP.
[2] As of September 21, 2020, KRW 1,000 is equivalent to US$ 0.86 or € 0.73.

cannot spend the stimulus payments in Seoul. To further strengthen the identification, we exploit another restriction that the stimulus payments must be spent at establishments allowed by the government and compare DID estimates between the allowed and non-allowed sectors.

We demonstrate evidence that the stimulus payments increased card spending of Seoul residents by 21.5% in the following week of the disbursement, and the positive spending impact remained over the next five weeks. However, we find little evidence that the payments increased card spending among non-Seoul residents. Then we document that the increase in card spending was entirely driven by increases in spending in allowed sectors. Our back-of-the envelope calculation indicates that 29% of the total disbursement to Seoul residents was spent during the first seven-week period. The spending level reached its bottom during the peak period of COVID-19 in early March, and it was already restored to the pre-COVID-19 level by early May, 2020. This fact suggests that the impact of the stimulus payments could have been larger if they were disbursed in early March instead of mid May.

To further understand underlying factors that determine the spending response to stimulus payments, we conduct the following heterogeneity analysis. First, in a standard life-cycle model with liquidity constraints, spending responses are expected to be greater among households with tighter credit constraints. To inform an ongoing debate about whether next stimulus packages should be means-tested or across-the-board, we examine heterogeneity by income as a proxy for liquidity constraints. Second, we examine if individuals' risk avoidance behavior affects consumption responses because, unlike previous recessions, the COVID-19 situation can discourage spending via risk avoidance behavior. We use the number of cumulative COVID-19 cases as a proxy of perceived infection risks. We find that the spending response was greater in areas i) where the average household income is lower, ii) with fewer cumulative confirmed COVID-19 cases. The results imply that both individuals' liquidity constraints and risk avoidance behavior are likely to have affected the effectiveness of the stimulus payments.

It is important for stimulus payments to be flowed to businesses more affected by COVID-19. Hence, we examine if the spending response to the stimulus payments are larger in areas most severely affected by COVID-19. We find that the stimulus payments made the economic losses of the COVID-19 outbreak more unequal because spending responses to stimulus payments were larger in areas less severely affected during the peak period of COVID-19.

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 et al., 2014; Parker et al., 2013; Parker, 2017). For example, Johnson et al. (2006) and Parker et al. (2013) document that tax rebates during recessions in 2001 and 2008 increased households spend more than half of stimulus payments within 3 months. However, these studies can only provide partial insights on the impact of COVID-19 stimulus payments. One of key distinctions between the pandemic-induced recessions and the previous recessions is that there could be a trade-off between stimulus payments and disease infection risks (Kaplan et al., 2020). This implies that individuals' risk avoidance behavior and uncertainty regarding the spread of the virus and vaccine developments and social distancing measures can affect their spending responses to the stimulus payments. To fill this gap in the literature, Baker et al. (2020), Chetty et al. (2020) and Coibion et al. (2020) estimate the spending impact of the U.S. CARES Act. Baker et al (2020), using individual bank transaction data, show that American households spend 29% of the CARES payments within 10 days, while Coibion et al. (2020) find the MPC of 42% using survey data from the Nielsen Homescan Panel.

Our study contributes to the literature by overcoming identification issues of the existing studies. It is well-documented that consumption spending has significantly changed over a few months since the COVID-19 outbreak (Chetty et al., 2020). Since the stimulus payments have been introduced in the middle of the pandemic, it is difficult to isolate consumption responses to the payments from the direct effects of the COVID-19. Baker et al. (2020) and Chetty et al. (2020) demonstrating consumption patterns over 10 days around and the day of implementation of the CARES Act using event-study design type approach and the regression discontinuity design. The results may provide limited insights on the effects of the stimulus payments by investigating only short-term effects. We complement these studies by exploiting the unique features of Korea's usage restrictions of stimulus payments to create comparable control groups to identify the causal impact of stimulus payments on spending. Second, there is a growing call for place-based, sector-specific COVID-19 aid packages given the inequality in the labor market and sales shocks across regions and sectors (Chetty et al. 2020; Kaplan et al., 2020). Our findings imply that place-based and sector-specific COVID-19 assistance can be effectively implemented to help areas and sectors with larger losses. Third, to our best knowledge, we provide first causal evidence on the spending response to COVID-19 stimulus payments outside the U.S. context,

which could be in particular useful as several countries are about to or consider to implement similar packages. Korea never imposed a large-scale lock-down of the economy, while the CARES payments were disbursed in the midst of the statewide lockdowns and stay-home orders, which severely limits spending activities. In addition, Korea's gross domestic savings rate is about twice higher than that of the United States (The World Bank, 2020). The pre-pandemic saving level could affect households' consumption responses to stimulus payments via liquidity constraints.

We also contribute to the literature by estimating the effects of COVID-19 stimulus payments using financial transaction data. Although Baker et al. (2020) and Chetty et al. (2020) also use bank and card transaction data, respectively, to overcome limitations of self-reported survey data of household spending, the authors investigate only short-term responses (within 10 days) to the stimulus payments. Estimating only short-term effects are likely to provide limited evidence on how effectively the payments stimulate household spending. We add to the literature by examining dynamic responses over a longer period (6 weeks) after the disbursement of the stimulus payments.

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

2. Background on COVID-19 Stimulus Payments in South Korea

The Korean Congress passed a law on April 30, 2020 that authorized the stimulus payment program to boost the economy damaged by the COVID-19 outbreak by stimulating household consumption spending. A single household received the one-off payment of KRW 400,000 (US$345 or €291), and the amount increased by KRW 200,000 (US$173 or €146) with each additional household member, up to KRW 1,000,000 for those with four or more members (US$864 or €723).

There were three different modes of receiving the stimulus payments: 1) cash, 2) a direct deposit to a credit or debit card account, 3) gift certificates or a prepaid gift card. Households with all members as current beneficiaries of other public means-tested welfare programs were able to receive the stimulus payments in cash and they did not need to apply for the program. However, all other households were required to apply and choose their preferred payment mode

between the second and third options. 12.9%, 66.1% and 21.0% of Korean households received the stimulus payments in cash, a direct deposit to a credit or debit card, and gift certificates or prepaid gift cards, respectively (Ministry of the Interior and Safety, 2020). In the case of Seoul, 10%, 75.2%, 14.7% of households received the payments in cash, a direct deposit to a credit or a debit card, and gift certificates or prepaid gift cards (Ministry of the Interior and Safety, 2020).

The payment disbursement dates varied by payment modes. Cash payments were disbursed on May 4, 2020. Households who wanted to receive payments via a direct deposit to a credit or a debit card could apply for the payments online from May 11, 2020 (the 20th week of the year) and the actual disbursements were made two days after the application. People who could not apply online or wanted to receive gift certificates (in a paper form) or a prepaid gift card (in a magnetic stripe card form) could receive the payments upon the application from May 18, 2020. By May 25, 2020 and June 7, 2020, 95% and 99.5% of all households in Korea applied for the stimulus payments, respectively. In total, Seoul residents received KRW 2.57 trillion.

To help small businesses and sectors more severely affected by COVID-19 without increasing infection risks, the government restricted the use of stimulus payments. First, the payments can only be spent in the province (or equivalent metropolitan city) of residence. For example, Seoul residents cannot use their stimulus payments outside Seoul. Second, the payments must be spent in the sectors pre-specified by the government. For example, online transactions, department stores, Walmart-like hypermarkets, gyms, hotels and entertainment outlets, such as casinos, bars, pubs and karaokes, were excluded because these sectors were not affected much by the pandemic or involve physical interactions. Third, the payments must be spent by the end of August, 2020, making it impossible left unspent. Otherwise, the payments would be forfeited. These three restrictions were not applicable to households who received the stimulus payments in cash.

3. Data

For the empirical analysis, we use block- and week-level card transaction data, covering the period from January 2019 to July 2020 and 15,698 blocks in Seoul.[3] We use estimates of daily card spending based on proprietary offline card transaction data from Shinhan Card, the largest

[3] A block is the minimum official geographic boundary defined by Statistics Korea. Its average size is less than 0.1 km^2 (0.39 mi^2).

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 additional information such as the market share of the card company and the card usage patterns based on sector, location, time, and demographic subgroups. Our dataset is based on 3.42 billion card transactions in Seoul including both credit and debit cards.[4] According to the Korean central bank's report, card transactions represent 63% of the total payment modes (Bank of Korea, 2020). The high-frequency, large-scale data with granular variations across geographies and subgroups allow us to conduct rigorous empirical analysis.

The data provide transaction information by cardholders' residence and sectors of retail establishments. Since the COVID-19 stimulus payments were paid out to households, we use card spending data generated by individual cardholders in the baseline analysis, which accounts for 92% of total card transactions.[5]

Figure 1 shows the trends of differences in the average weekly card spending per block and log(average weekly card spending per block) in Seoul between 2019 and 2020 in panels A and B, respectively, using the block- and week-level panel data.[6] In 2020, compared with 2019, there was little change in card spending during the first six weeks. However, it sharply reduced from Week 7 onward, when the number of confirmed cases increased in Seoul.[7] From the 11th week, the differences in card spending started to rebound, and reached the pre-pandemic weekly spending level around the timing of the introduction of the stimulus payments. Coinciding with the payment disbursements, card spending sharply increased in the 21st week and gradually declined following weeks.

Table 1 shows the descriptive statistics of our data. [TBD]

[4] The data access is given via the Big Data Campus office of the Seoul metropolitan city government. We do not have access to transactions occurring outside Seoul.

[5] We use the spending data generated by corporate card holders as a falsification check. We do not find evidence that the stimulus payment increased card spending by corporate card holders. The results are available upon request.

[6] Figure A1 shows trends of weekly card spending per block in Seoul in 2019 and 2020 together.

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

4. Empirical Strategy

The primary goal of this one-off public transfer is to boost the virus-stricken economy by encouraging consumers to spend via a windfall income gain. To examine the extent that stimulus payments lead to a spending increase, we compare changes in card spending over weeks between 2019 and 2020 using the following generalized DID regression model, commonly adopted in COVID-19 literature (e.g., Chetty et al., 2020):

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

where $y_{i,t}$ is log-transformed card spending of block *i* in week *t* transacted by Seoul residents. $Year_t$ 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, which captures the effects of COVID-19. The key identification assumption here is a parallel trend in card spending between 2019 and 2020 within the same block. Since the disbursement of Korea's stimulus payments began in the 20th week of 2020, the impact of stimulus payments is incorporated in δ_ks in which the value of *k* is greater than 19. For statistical inference, we calculated standard errors clustered at the block level, unless specified otherwise.

To test the parallel trend assumption indirectly, we can examine if the trends of card spending between 2019 and 2020 are parallel before the introduction of the stimulus payments. However, this assumption is difficult to justify because of the associations between card spending and COVID-19. As indicated in Figure 1, the stimulus payments were disbursed when the economy recovered to its pre-pandemic level in terms of card spending. This implies that it is difficult to isolate the effects of the stimulus payments from the effects of the business cycle. Our estimates can over-emphasize the true effects of the stimulus payments if spending had been increasing even without the transfers. To overcome this identification challenge, we consider the effects of COVID-19 on spending by non-Seoul residents as a counterfactual. Since the stimulus payments can be spent only in the province of residence, the payments should not affect non-Seoul residents' spending in Seoul. In addition to using this place-based policy rule, we also exploit the fact that individuals can spend the payments only in some pre-selected sectors. If a spending increase after the payment disbursement in the allowed sectors is indeed due to the

COVID-19 stimulus payments, we should not be able to observe a similar increase in the non-allowed 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 with 95% confidence intervals. Black and empty squares represent the estimated spending impact of the COVID-19 stimulus payments among Seoul residents and non-Seoul residents, respectively. The estimates after Week 6 indicate that COVID-19 sharply reduced card spending regardless of the location of residence. The negative spending impact began to rebound in Week 10 and almost reached the pre-pandemic level by Week 19. Until the stimulus payment disbursement, spending patterns were similar between Seoul and non-Seoul residents. However, the introduction of stimulus payments in Week 20 resulted in stark differences. Seoul residents' card spending immediately increased by 5.6% in Week 20, while it did not affect card spending by non-Seoul residents. It is noteworthy that people began to apply for the stimulus payment program from this week and the earliest possible date they could receive the payments was Wednesday of the week. Then, in Week 21, when many more households received the payments, card spending among Seoul residents surged by 21.5%. Although the magnitudes became gradually smaller, the estimates remained positive and statistically significant at the 1% level until Week 25. By contrast, we find little evidence that the stimulus payments increased card spending among non-Seoul residents. Overall, the results imply that the stimulus payments boosted the local economy in terms of card spending.

Then, we investigate the effects of COVID-19 stimulus payments on card spending by types of sectors. The government restricted spending of stimulus payments within pre-specified sectors.[8] If the stimulus payments indeed increased card spending, we expect that spending increases would be concentrated in those pre-specified sectors. Figure 3 plots the DID estimates of the effects of the stimulus payments on card spending in sectors that can and cannot accept

[8] This policy rule was not applicable if households received the stimulus payments in cash. We cannot observe cash transactions. This limitation can underestimate the true spending effects of the stimulus payments because cash recipients of the stimulus payments are beneficiaries of means-tested welfare programs and they are likely to have a higher value of MPC.

stimulus payments in panels A and B, respectively. Panel A shows similar patterns to those of Figure 2. The effects of COVID-19 on card spending before the introduction of the payments were similar between Seoul and non-Seoul residents. However, once the payments were introduced, card spending in the allowed sectors by Seoul residents sharply increased in Week 20 with the positive impact lasting over the next five weeks. However, we do not see the similar pattern among non-Seoul residents. In addition, panel B shows that the payments did not change card spending in the non-allowed sectors, regardless of cardholders' registered address. The results indicate that the increase in card spending observed in Figure 2 among Seoul residents is mainly driven by increases in card spending in the allowed sectors. This provides additional evidence that the stimulus payments increased card spending.

To quantify the MPC out of the COVID-19 stimulus payments, we sum up the DID estimates of Seoul residents from Week 20 through Week 26 in Figure 2. The estimated spending increase in levels is KRW 596.5 billion (US$ 512 million). The size of the stimulus payment to Seoul households excluding cash was KRW 2.38 trillion. Although we do not know the information about the amount of stimulus payments given in gift certificates and prepaid cards, this payment mode accounts for 14.2% of households in Seoul. If we assume that the payment amount is identical between the two payment modes (credit/debit cards vs. gift certificates or prepaid cards), the total amount of stimulus payments paid out via credit/debit cards is KRW 2.04 trillion. This suggests that our MPC estimate of Korea's COVID-19 stimulus payments is 29%.[9]

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. (2020) reported that individuals spent or plan to spend 42% of the payments based on a household spending survey. Using financial transaction data Baker et al. (2020) showed that people spend 29% of the stimulus payments in just10 days after receiving the check and Chetty et al. (2020) showed 26 and 9 percentage points increases in consumption spending in the first week after the payment among bottom-income quartile and top-income quartile groups, respectively. The MPC estimates of the U.S. CARES stimulus payments are smaller than the

[9] It is possible that the household size is smaller among those who receive stimulus payments in gift certificates or prepaid cards. Thus, their payment amount could be smaller than those who receive stimulus payments in credit/debit cards. If this is the case, we underestimate the true value of MPC to some extent.

estimated MPCs of the tax rebates from the past recessions. Johnson et al. (2006) showed that the 3-month MPC of the 2001 tax rebates was around 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 stimulus payments as well as the MPC estimates of the 2001 and 2008 tax rebates.

Heterogeneity Analysis

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

First, a life-cycle model with an incomplete capital market 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 median monthly income in the neighborhood (called *Dong* in Korean) by presuming that those in low-income neighborhoods are likely to have tighter liquidity constraints.[10] Since the average household income data are available at the neighborhood level, we estimate the effects of the stimulus payments on card spending at the neighborhood level. Panel A shows the relationships between the estimated spending responses in Week 21 and the log value of household income. It indicates that the spending response to the stimulus payments are greater in neighborhoods with lower average income. A 1% increase in neighborhood-level household income is associated with a 0.2% decrease in the estimated card spending impact in Week 21. This relationship is statistically significant at the 1% level.[11] The results suggest that households' liquidity constraints are likely to have played a role in determining the effectiveness of stimulus payments. The existing studies evaluating the impact of stimulus payments via the 2020 CARES Act in the United States also document greater spending responses among low-income households (Baker et al., 2020; Chetty et al., 2020). A policy implication of this finding is that means-tested transfers would be more efficient than across-the-board payments.

[10] Our data do not provide 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.

[11] For statistical inference, we calculate the bootstrapping standard error by randomly selecting 100 *Dongs* and re-estimate the linear association between DID estimates in Week 21 and log of the average income in the neighborhood. We repeat this procedure 3000 times.

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 stimulus payments. This implies that the spending response to the stimulus payments could be heterogeneous by the degree of individuals' perceived risks of the virus. As a proxy for the perceived COVId-19 infection risk, we calculate the number of cumulative confirmed individuals in the district (called *Gu* in Korean) because the cumulative case statistics are only available at the district level. To be comparable, we estimate the effects of the stimulus payments on card spending by Seoul residents at the district level. Panel B plots DID estimates in Week 21 against the number of cumulative COVID-19 confirmed cases across districts in Seoul. The negative association between the estimated spending responses to the stimulus payments and the number of cumulative confirmed cases indicates that the effects of stimulus payments were weaker in districts where individuals perceived a higher risk of infection. The findings are consistent with those in the United States where the consumption spending impact of the CARES Act was larger among sectors with little physical interactions with customers (Chetty et al., 2020). The results imply that individuals' incentives to avoid risk may have affected the effectiveness of COVID-19 stimulus payments. There is an ongoing debate about the tradeoff between saving lives and economic recovery, but our finding suggests that containing the virus itself as quickly as possible can be an effective economic stimulus policy. If we take the linear relationship in Panel B at the face value, reducing the cumulative confirmed cases per district from 60 to 30 increases the MPC by 6.6 percentage points.

Third, the stimulus payments were intended to help businesses that lost much revenue during the COVID-19 outbreak. Hence, it is of great interest to policymakers and researchers to understand whether and how much the stimulus payments helped affected businesses. However, the unique nature of the COVID-19-induced recession implies that businesses that suffered most are not necessarily the largest beneficiaries of the stimulus payments if consumers continue to shun those businesses (e.g., gyms, hotels, restaurants) due to the virus exposure risk. To address this issue, we use the magnitude of the estimated spending reduction in Week 10 of each neighborhood, the peak period of sales losses as indicated in the baseline analysis, as a proxy measure of the COVID-19 sales shock. Panel C shows that much of stimulus payments flowed to businesses that experienced relatively smaller negative sales losses during the peak period of COVID-19, consistent with the U.S. findings (Chetty et al., 2020; Coibion et al., 2020). As

robustness checks, we also use the minimum value of δ_k estimates (the largest sales loss during COVID-19 within a block), and the estimate of δ_{11} (Week 11's estimate), instead of δ_{10}. The results reported in Panels A and B of Figures A3 remain similar. Our finding suggests that the stimulus payments have actually amplified the gap in economic losses across areas, implying that targeted stimulus payments for sectors most affected by COVID-19 could be a more efficient approach to narrowing gaps in COVID-19-induced economic losses across areas.

To further examine sector heterogeneity regarding the impact of COVID-19 and the stimulus payments, in Figure 5, we show the magnitude of the COVID-19 spending shocks measured by the sum of the DID estimates from Week 9 through Week 19 (red bars) and the magnitude of the impact of the stimulus payments measured by the sum of the DID estimates from Week 20 through Week 26 (blue bars). Consistent with Panel C of Figure 4, the stimulus payments did not flow to the sectors suffered during the pandemic.

6. Conclusion

We analyze the impact of Korea's one-off COVID-19 stimulus payments on card spending using high-frequency, large-scale offline card transaction data in Seoul. The Korean government's stimulus payment program is distinct from other countries because the government mandated the payments to be used only in the province of residence and in pre-specified sectors (e.g., excluding online transactions and large retailers). We find evidence that the stimulus payments increased card spending in Seoul. Consistent with the spending restrictions, the policy impact is driven by Seoul residents and the sectors allowed by the government. The spending response to the stimulus payments are weaker in areas with higher average income and more cumulative COVID-19 cases, suggesting the importance of liquidity constraints and risk avoidance. Our back-of-the-envelope calculation suggests that households spend 29% of stimulus payments in the first seven weeks. We also find that much of the stimulus payments flowed to businesses less affected by the pandemic, making economic losses more unequal. Consistent with recent studies on the COVID-19 stabilization packages in the United States (Chetty et al., 2020; Kaplan et al., 2020), our findings imply that, instead of across-the-board grants, place-based, sector-specific stimulus packages are more efficient.

We acknowledge limitations of this study that can be fruitful avenues for future research. First, our data cover card transactions that occurred only in Seoul. It would be interesting to

examine heterogeneous effects across different regions. Second, our evidence provides only short-run, 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.

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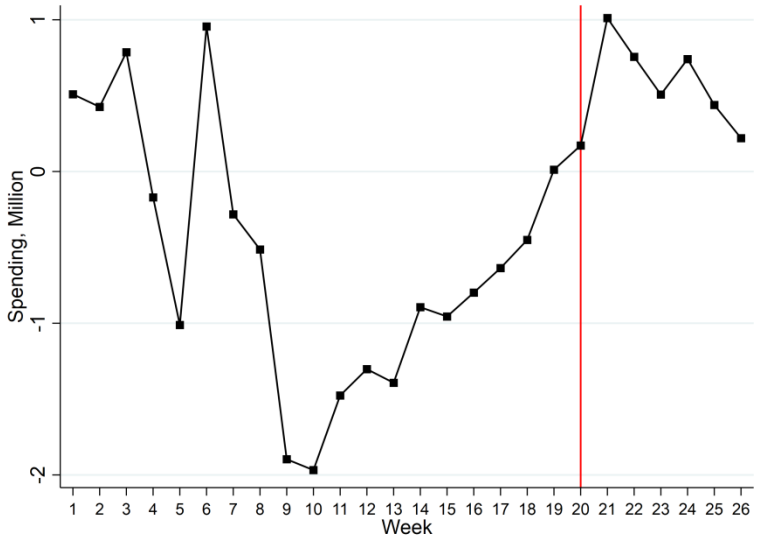
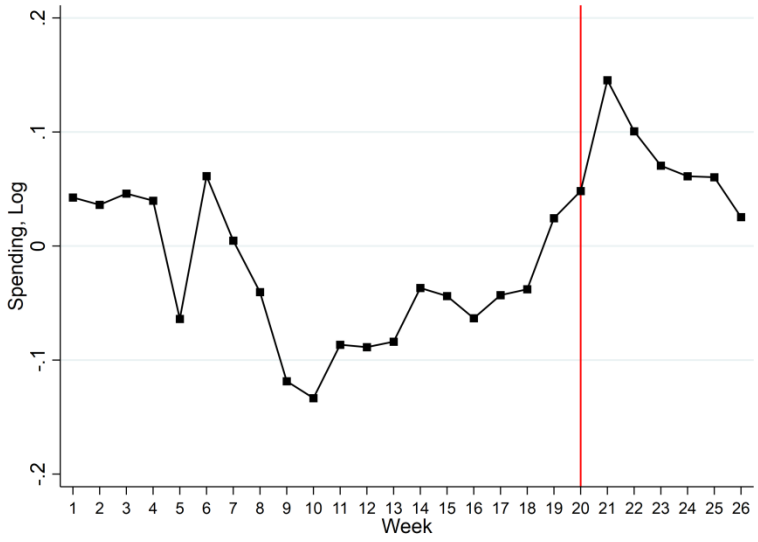
Figures and Tables

Figure 1. Trends of Differences in Card Spending in Seoul

A. The Average of Weekly Card Spending Per Block

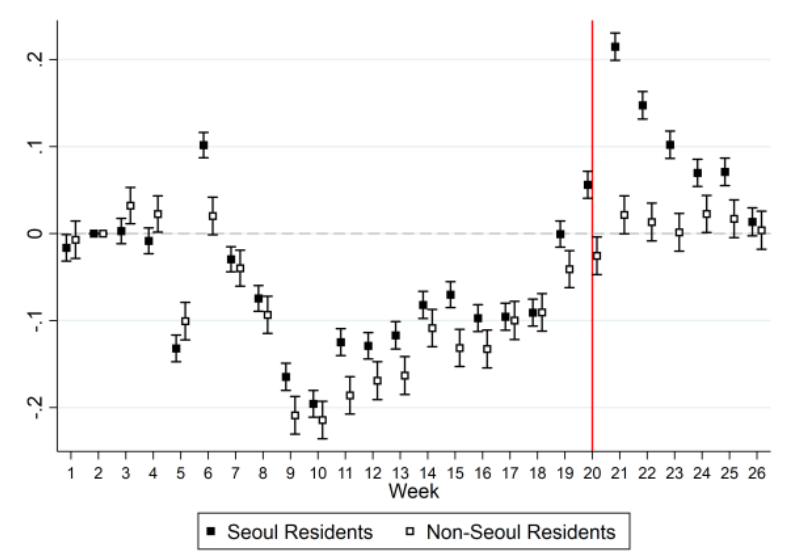


B. Log(Average of Weekly Card Spending Per Block)



Note. A block is the minimum official geographic boundary defined by Statistics Korea. Its average size is less than 0.1 km^2 (0.39 mi^2).

Figure 2. DID Estimates of the Effects of the Stimulus Payments on Log(Average Daily Card Spending Per Week-Block)

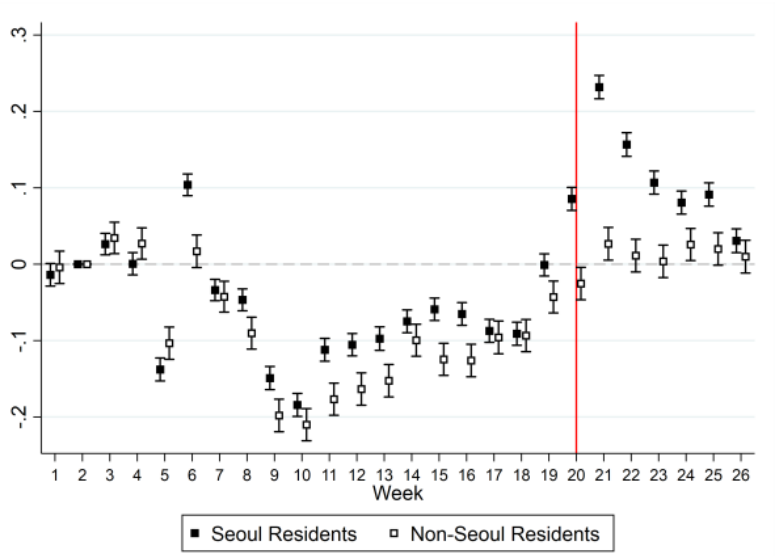


Notes. Black and empty squares represent the estimated sales impact of the COVID-19 stimulus payments among Seoul residents and non-Seoul residents using equation (1), respectively. Standard errors are clustered at the block-level. Caps indicate 95% confidence intervals.

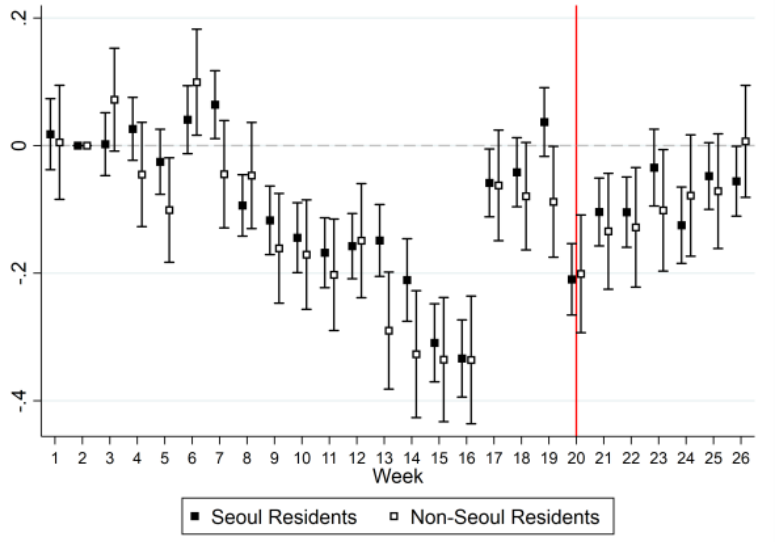
Figure 3. DID Estimates of the Effects of the Stimulus Payments on Log(Card Spending)

Allowed Sectors vs Not Allowed Sector

A. Allowed sectors



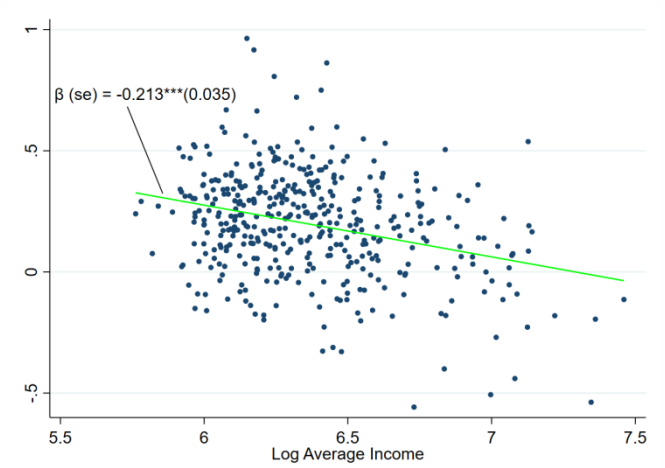
B. Not allowed sectors



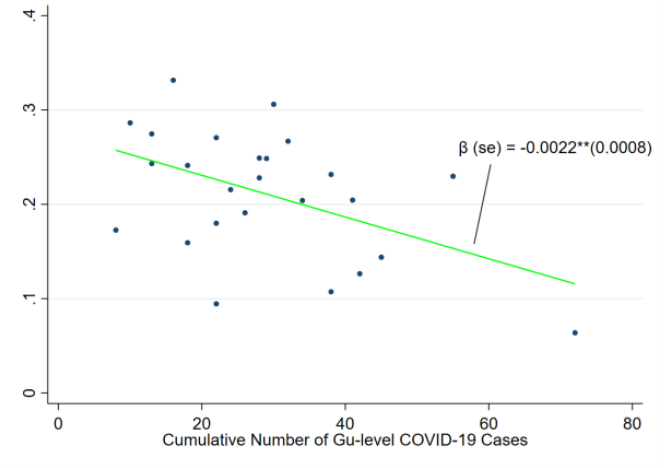
Notes. Black and empty squares represent the estimated sales impact of the COVID-19 stimulus payments among Seoul residents and non-Seoul residents using equation (1), respectively. Standard errors are clustered at the block-level. Caps indicate 95% confidence intervals.

Figure 4. Heterogeneous Effects of the Stimulus Payments

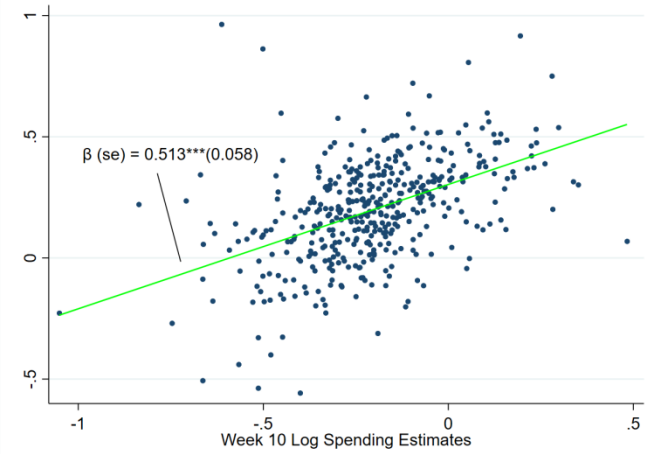
A. By Log(Average Monthly Household Income)



B. By the Cumulative Number of Confirmed Cases



C. By Economic Losses during COVID-19



Notes. We re-estimate the effects of the stimulus payments in each Dong in panels A and C and in Gu in panel B. We plot asscoiations of DID estimates in Week 21 with log of average monthly household income, the cumulative number of confirmed cases, and a measure for economic losses in panels A to C.

Figure 5. Spending Response to the Stimulus Payments by Sector

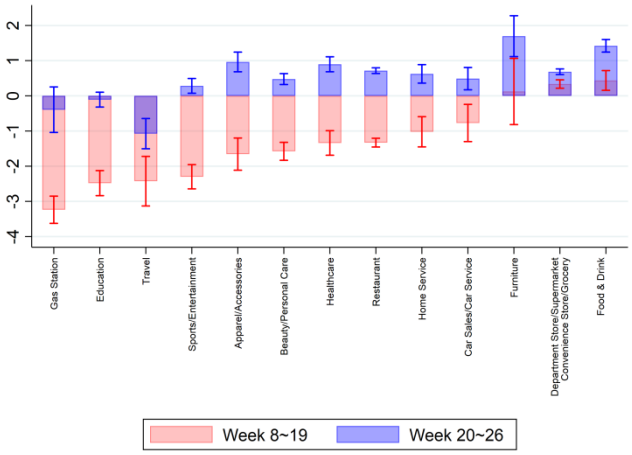
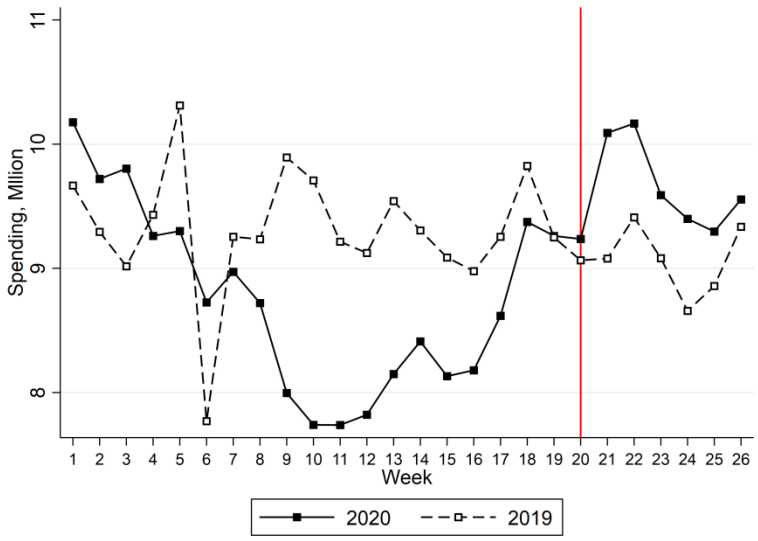


Figure A1. Trends of Differences in Retail Sales in Seoul

A. The Average of Weekly Retail Sales Per Block



B. Log(Average of Weekly Retail Sales Per Block)

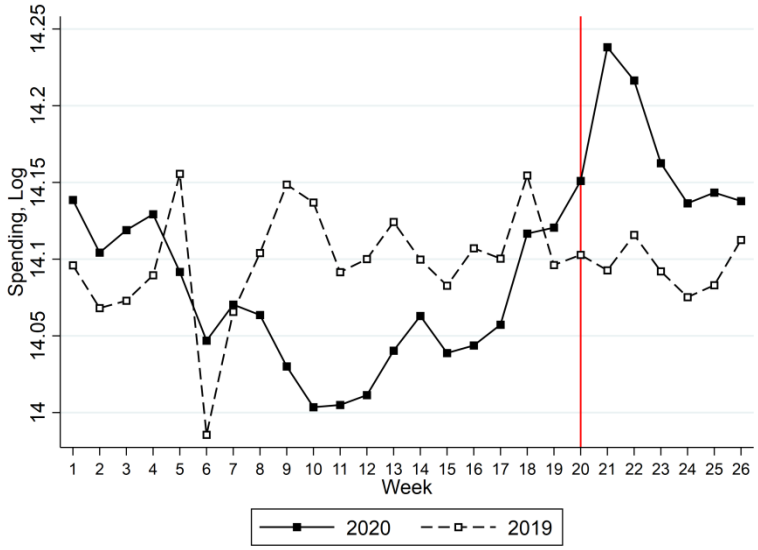
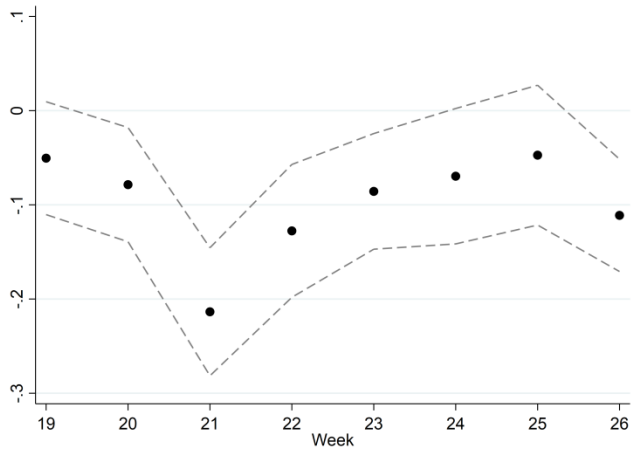
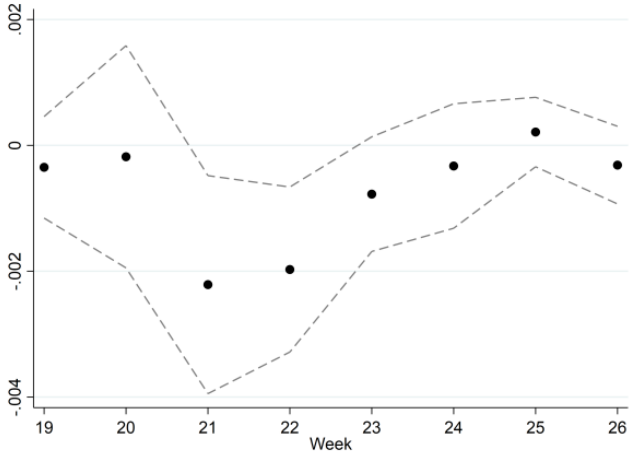


Figure A2. Dynamics of Heterogeneous Effects of the Stimulus Payments

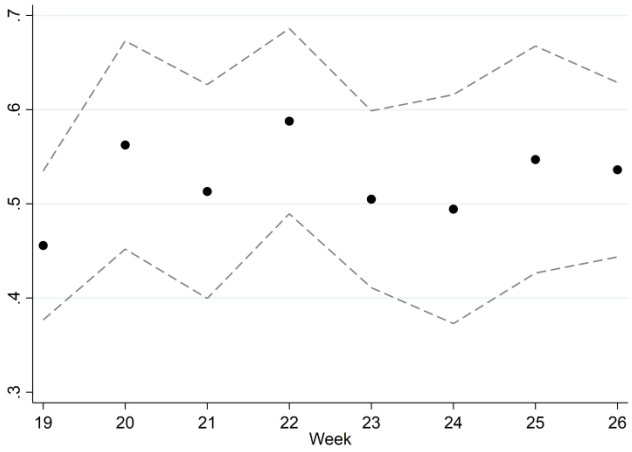
A. By Log(Average Monthly Household Income)



B. By the Cumulative Number of Confirmed Cases



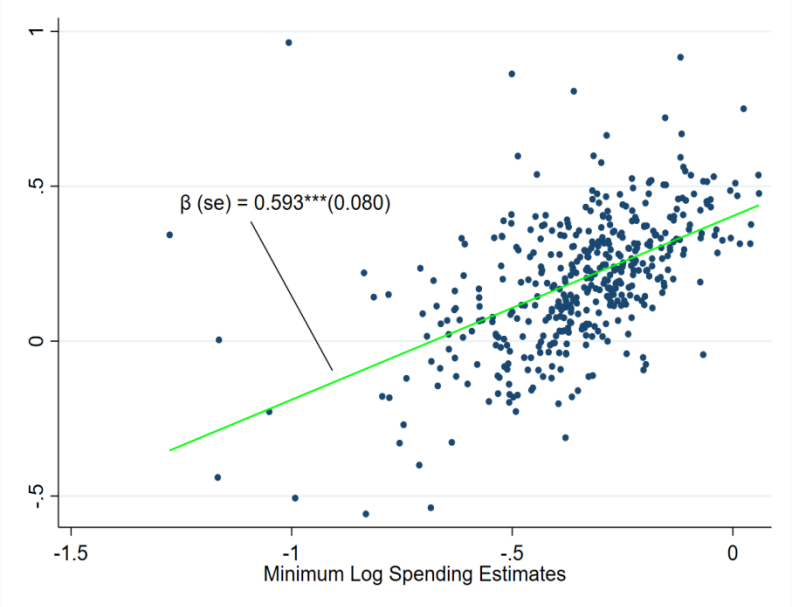
C. By Economic Losses during COVID-19



Notes. We re-estimate the effects of the stimulus payments in each Dong in panels A and C and in Gu in panel B. We plot associations of DID estimates in Weeks 19 to 26 with log of average monthly household income, the cumulative number of confirmed cases, and a measure for economic losses in panels A to C.

Figure A3. Heterogeneous Effects of the Stimulus Payments By Economic Losses

A. By Maximum Economic Losses during COVID-19



B. By Economic Losses during Week 11