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## Short-Term Impact of COVID-19 on Consumption and Labor Market Outcomes: Evidence from Singapore

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DISCUSSION PAPER SERIES

IZA DP No. 13354

**Short-Term Impact of COVID-19 on  
Consumption and Labor Market  
Outcomes: Evidence from Singapore**

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# Short-Term Impact of COVID-19 on Consumption and Labor Market Outcomes: Evidence from Singapore

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## ABSTRACT

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# Short-Term Impact of COVID-19 on Consumption and Labor Market Outcomes: Evidence from Singapore\*

We examine the short-term impact of COVID-19 on consumption spending and labor market outcomes. Using monthly panel data of individuals mainly aged 50–70 in Singapore, we find that COVID-19 reduced consumption spending and labor market outcomes immediately after its outbreak, and its negative impact quickly evolved. At its peak, the pandemic reduced total household consumption spending by 22.8% and labor income by 5.9% in April. Probability of full-time work also went down by 1.2 pp and 6.0 pp in April and May, respectively, but employment and self-employment were only mildly affected. Our heterogeneity analysis indicates that the reduction in consumption spending was greater among those with higher net worth, while the decreases in labor market outcomes were greater among those with lower net worth. However, we find little evidence that those in worse health status experienced larger reductions in consumption spending and labor market outcomes. Reductions in consumption spending correlated with increased risk avoidance behavior, the nationwide partial lockdown, worsening economic outlook, and reduced income.

**JEL Classification:** E2, I12, H2, J01

**Keywords:** COVID-19, pandemic, consumption spending, labor market, monthly panel data

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## 1. Introduction

The outbreak of the COVID-19 pandemic has caused profound health shocks worldwide, resulting in more than 400,000 deaths. To contain the virus in the absence of effective drugs and vaccines, many governments have implemented a wide variety of non-pharmaceutical interventions (NPI) at an unprecedented scale (Hale et al. 2020). Citizens have also exhibited risk avoidance behaviors, such as wearing a face mask and staying at home, even before governments imposed restrictions such as necessary quarantines and social distancing practices.

While these efforts are necessary to contain the pandemic, they can be detrimental to the economy. COVID-19 can initially contract household consumption via various channels such as the fear of infection and death, government-imposed NPIs, and heightened economic uncertainty. This consumption contraction then lowers firm sales, thereby reducing labor demand, which in turn can further reduce household consumption (Guerrieri et al. 2020). Thus, understanding how and why consumption spending and labor market outcomes have changed during the crisis is critical to inform public policy so that the adverse impact is mitigated and the economy rebounds more rapidly.

In this paper, we estimate the impact of the COVID-19 outbreak on consumption spending and labor market outcomes in Singapore. Particularly, we use individual-level panel data of Singaporeans mainly aged 50–70 from the Singapore Life Panel (SLP), which collects monthly information on consumption spending and labor market outcomes. For identification, we employ a difference-in-differences (DID) model. We compare the changes in consumption spending and labor market outcomes for the same individuals within the same month (compared to January) in the 2019–2020 season against the same changes one year ago.<sup>1</sup> Additionally, we examine the heterogeneous impact by underlying health status and wealth and potential mechanisms behind consumption and labor market responses by exploiting the rich information available in the SLP data.

We document that COVID-19 has decreased household consumption spending and labor market outcomes immediately and significantly. Total consumption spending decreased by 7.3% in February 2020 and 9.0% in March 2020 when the total number of cases was still

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<sup>1</sup> In the context of our study, we define a “season” as the period from July in the previous year to May this year.

relatively low.<sup>2</sup> In April, it further reduced by 22.8% when the number of new cases surged and the nationwide partial lockdown policy was implemented. Spending on non-durable goods shows a similar pattern, while the expenditure on durable goods remained constant until March, but it plummeted by 21.4% in April. As for labor market outcomes, we restricted the sample to those aged between 50 and 64 to examine individuals who are still active in the labor market. We find little evidence that COVID-19 induced declines in the probability of employment and self-employment until April, but the employment rate declined by 2.3 pp in May. By contrast, the probability of working full-time, conditional on working, declined by 1.2 pp in April and 6.0 pp in May, and monthly labor income decreased by about 2% each in February and March and by 5.9% in April.

Our heterogeneity analysis shows that the reduction in consumption spending was greater among those households with greater net worth (above the median), whereas the decreases in labor market outcomes were greater among those with lower net worth (below the median). Individuals with lower wealth experienced a decline of 9.9% in labor income and lower-wealth households experienced a 20.0% decline in consumption spending, while higher-wealth people experienced only a 3.0% decline in labor income but a 25.7% decline in consumption spending.<sup>3</sup> However, although we expect to see larger reductions in consumption spending and labor outcomes among individuals with worse health status, we find little evidence on these.

Concerning mechanisms for the decline in consumption spending, we find evidence that individuals i) lowered the frequency of leaving their homes due to the lockdown policy and the desire to avoid the risk of infection; ii) lowered their expectations about their economic future, as measured by subjective job loss probability and by increased saving; and iii) suffered a decrease in their household incomes. Regarding mechanisms for decreasing labor market outcomes, we find that the reduction in the size of labor income is larger than the decline in working hours (both are conditional on working).<sup>4</sup> Based on the implied decrease in hourly wages, we argue that deteriorating labor market outcomes are mainly driven by declining labor demand rather than a decrease in labor supply.

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<sup>2</sup> The cases confirmed by the end of March accounts for less than 2.5% of the total cases confirmed by June 9.

<sup>3</sup> The larger decline in consumption spending among wealthy households is mainly due to the reduction in discretionary spending.

<sup>4</sup> In April, labor income declined by 5.9%, while the probability of full-time work status only decreased by 1.2 pp (1.6%), implying a reduction in hourly wage.

Our findings provide several policy implications. First, the baseline results imply that consumption spontaneously responds to health shocks even before the intense NPIs (e.g., closure of schools and businesses) were imposed by the government, while labor market adjustments, especially along the extensive margin, were relatively mild, possibly because of the large-scale government support packages for workers. Second, our heterogeneity analysis on consumption spending by household net worth shows that subsidies that decline with households' income may be more efficient in stimulating the economy rather than across-the-board income grants, because the drop in consumption by relatively high-wealth households is less likely due to increased liquidity constraints, and high-wealth households even increase saving during the pandemic. Third, our analysis on the consumption decline mechanisms imply that alleviating perceived uncertainties among the general public about the pandemic and future economic conditions can be an important pathway to economic recovery. Last, as reduction in labor demand is likely to be the main driver of worsening labor market outcomes, large-scale wage subsidies to employers, being implemented by the Singapore government from April onward, would be effective in restoring the economy, as they can boost labor demand.

This study is related to the rapidly growing literature on the economic impact of COVID-19. First, several studies have examined consumer behavior mainly using financial transactions data (Anderson et al. 2020; Baker et al. 2020; Carvalho et al. 2020; Chen, Qian, Wen 2020; Coibion, Gorodnichenko, and Weber 2020; Surico et al. 2020). The reduction in consumption spending ranges from 25% in Denmark to nearly 50% in Spain, while the decline in China and the US is slightly above 30%, and the UK experienced a 41% decrease. Second, many studies have focused on examining labor market outcomes (Adams-Prassl et al. 2020; Aum, Lee, and Shin 2020; Béland, Brodeur, and Wright 2020; Béland et al. 2020; Bernstein, Richter, and Throckmorton 2020; del Rio-Chanona et al. 2020; Hensvik, Le Barbanchon, Rathelot 2020; Kahn, Wiczer, and Lange 2020) using cross-sectional surveys or aggregate macro-level data. The estimated decline in employment rate varies from less than 5 pp in Germany to more than 9 pp in the US. In addition, the studies find a reduction in working hours and wages across countries and document that low-income groups are more adversely affected.

We contribute to the literature by providing evidence on the impact of COVID-19 on household consumption spending and labor market outcomes jointly, using high-frequency panel data. We investigate how and why COVID-19 has affected these outcomes through rich information on individual characteristics such as risk avoidance behavior, saving, perceived economic uncertainty, and chronic health conditions, which are typically unavailable in ad hoc

surveys conducted in the midst of the COVID-19 pandemic, transaction data, or labor survey data (e.g., the US Current Population Survey).

We also contribute to the literature by providing novel evidence of the economic costs of COVID-19. Existing studies focused on countries that experienced relatively severe health shocks, i.e. those with high case-fatality rates, and have reported significant, negative impact on both consumption spending and labor market outcomes. Although Singapore did not experience a high death toll—it experienced a case-fatality rate of 0.07%—compared to other countries, it still experienced profound economic disruptions. This result suggests that the large economic costs by COVID-19 are induced by factors beyond the direct health threats, such as government NPIs, individual risk avoidance behavior, and rising uncertainties from the lack of efficient medical treatments and economic conditions.

The remainder of this study is structured as follows. Section 2 describes the background of the COVID-19 outbreak in Singapore and discusses potential mechanisms behind the economic impact. Sections 3 and 4 present the data and the empirical strategy. Section 5 discusses the results, and Section 6 concludes.

## 2. Background

### 2.1. Overview of COVID-19 outbreak in Singapore

The first novel coronavirus case in Singapore was confirmed on January 23, 2020, a Chinese traveler from Wuhan. The government responded to the spread of the infection by raising risk assessment to its second highest level on February 7. As shown in panel A of Figure A1, the situation remained stable until the end of March, with a total of 926 confirmed cases. During this phase, the government's containment efforts focused on minimizing imported cases through border restrictions and restraining local transmission by strengthening surveillance, meticulous contact tracing and isolation procedures.<sup>5</sup> In addition, to protect the vulnerable elderly population, the government has suspended group activities for seniors since March 11, 2020.

However, by mid-April, the number of confirmed cases exploded due to the undetected contagion in the high-density dormitories of low-wage migrant workers. As of June 9, 2020,

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<sup>5</sup> For example, inbound flights from Wuhan were banned from January 23, 2020. Chinese visitors and non-citizens who visited China fourteen days prior to arrival were banned from entering Singapore on February 2, 2020. Residents returning from China after February 19 were ordered to stay home for two weeks.



the total number of confirmed cases is 38,514.<sup>6</sup> 94% of these cases are tied to low-skilled migrant workers' dormitories. To address the spike in confirmed cases in April, the Singapore government imposed a set of nationwide partial lockdown policies, called the circuit breaker (CB), initially from April 7 to May 4, 2020. During the CB period, there were restrictions for workers in “non-essential services” to work from home, and the requirement for all schools to be closed. Only “essential” services, deemed as such by the government, e.g., healthcare (excluding non-urgent care), transportation, restaurants (delivery and take-away orders), groceries, could operate. No social gatherings were allowed outside the same household. One week after the CB, daily bus ridership and subway ridership plummeted by 71% and 75%, respectively (Singapore Land Transport Authority, 2020). On April 14, the government made wearing a face mask mandatory and imposed a full lockdown on foreign worker dormitories. Nevertheless, the number of daily confirmed cases continued to remain high. Hence, on April 21, the government extended the CB until June 1.

A unique aspect of Singapore's COVID-19 situation is the persistently low mortality rate. Panel B of Figure A1 illustrates the trend of cumulative deaths due to COVID-19. The first two deaths were reported on March 21. Since then, the number of confirmed cases exploded to over 38,000. Yet, the COVID-19 case-fatality rate was only 0.06% (25 deaths), much lower than the worldwide mortality rate of about 6% (WHO, 2020). This is because infected migrant workers, who account for most of the confirmed cases in Singapore, are mostly young and healthy. In addition, the government quickly built community care facilities for COVID-19 positive patients with mild or no symptoms to prevent hospitals from becoming overcrowded.

To minimize the adverse economic impact of COVID-19, the Singapore government has introduced a set of relief measures such as: 1) direct wage subsidies (up to 75% of the first S\$4,600), 2) a cash transfer of S\$600–S\$1200 depending on income and property values;<sup>7</sup> 3) unemployment benefits of S\$800 a month<sup>8</sup>; 4) a S\$1,000 monthly payout for the eligible self-employed; 5) a S\$2 billion package to create 40,000 jobs. These measures altogether amount to about 20% of Singapore's GDP in 2019. The details of the government's COVID-19 support programs are provided in Appendix B.

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<sup>6</sup> Singapore's total population in 2019 was about 5.7 million (Singapore Department of Statistics, 2020).

<sup>7</sup> 1 SGD is equivalent to 0.72 USD (or 0.63 EUR) as of June 9, 2020

<sup>8</sup> Singapore does not have a public unemployment insurance program.

## 2.2. Mechanisms

The COVID-19 pandemic can reduce consumption spending via various channels: 1) people are less likely to leave their homes to avoid the risk of infection and due to the nationwide partial lockdown policy, and thereby spending less; 2) people become more precautionary due to heightened economic uncertainty, and thus increase saving; and 3) an unexpected decrease in household income (via layoffs, unpaid leave, lower wages) tightens budget constraints.

COVID-19 can worsen labor market outcomes by reducing both employers' labor demand and workers' labor supply. Due to reduced sales and uncertainties about the future economy, employers may want to reduce their labor costs. At the same time, due to the fear of infection and increased housework such as childcare and elderly care, workers may want to reduce employment or working hours. Considering a standard economic model of a competitive labor market, these changes in labor demand and supply could result in reductions in employment and/or working hours, while the impact on wages will depend on the extent to which side dominates.

## 3. Data

The SLP has surveyed nationally representative cohorts of Singapore residents mainly aged 50-70 since July 2015. It captures a rich set of data on spending, labor market activities, and other individual and household characteristics on a monthly basis. Additional questions are asked on a quarterly or an annual basis such as social activities, subjective expectations on job loss possibility, and household assets and debts.

The use of the SLP has several advantages in studying the impact of COVID-19. First, it tracks the same individuals before and during the pandemic on a monthly basis. Given that the severity of the pandemic has worsened in the past months, the high-frequency nature of the data allows us to investigate the dynamic impact of the pandemic. Second, it collects a vast array of information on individual characteristics such as risk avoidance behaviors, chronic health conditions, health literacy, and demographics, enabling us to assess the heterogeneous impact of the pandemic and potential mechanisms. Third, as opposed to other in-person surveys, the SLP is conducted online. Hence, participation is not disrupted by the pandemic especially when physical mobility is restricted.

As the primary dependent variables, we first construct several categories of monthly household consumption spending (total, durable, and non-durables, etc.) and saving, defined

as household income net of total spending at the household-level by combining information collected across more than 40 spending subcategories. When constructing household consumption spending measures, we use the information reported by each household's financial respondent, who is the most confident about reporting the household's financial information.<sup>9</sup> We presume that the information provided by the financial respondent will have minimum errors compared to that reported by other household members. However, the results are robust when using consumption spending measures reported by other household members. In addition, we consider individual-level labor market outcomes such as employment status, self-employment status, full-time work status (working 35 hours or more a week), and monthly labor income. Full-time work status and monthly labor income are provided only for (self-) employed workers. As the control variables, we only use time-varying individual characteristics such as age, age squared, marital status, and household size, because we include the individual-fixed effects in our regression analysis. For heterogeneity analysis, we use information on household net worth and chronic health conditions. Household net worth is computed as total assets net of total debts.<sup>10</sup> Chronic conditions include the following diseases: cancer, diabetes, stroke, heart problems, hypertension, arthritis, and psychiatric problems. The monetary units are in 2019 Singapore dollars and transformed into logarithm values, unless specified otherwise.<sup>11</sup> Additionally, to examine individuals' risk avoidance behaviors and expectations, we use information on the frequency of leaving home daily during the last month and the subjective probability of losing a job. The details of the variable definitions are included in Appendix C.

There are two remarks regarding the sample used in the empirical analysis. First, we use the SLP data from July 2018 through May 2020. Respondents report their monthly consumption spending and income of the previous month. Thus, the analysis of income and consumption spending includes information up to April 2020. Otherwise, we present empirical results up to May 2020. Second, we use different samples when analyzing consumption and labor market consequences. Household consumption spending responses are analyzed at the household level of the full sample. For labor market analysis, we restrict the sample to those aged 50-64 as of May 2020. We presume that restricting the working age sample allows us to

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<sup>9</sup> Unlike other household survey data, the SLP does not designate the household head or representative person.

<sup>10</sup> The SLP measures household assets and debts once a year in January. We use the average of household net worth between January 2018 and January 2020.

<sup>11</sup> We show the results using levels that can account for zero values in panel B of Table A2.

cleanly estimate labor market impact. The public pension claiming age, called Payout Eligible Age, is 65 in Singapore.<sup>12</sup>

Table A1 presents the summary statistics of our study sample as of January 2020. Column (1) shows the summary characteristics of the full sample. On average, sample participants are 63.2 years old. About 42% and 36% of the sample completed secondary and tertiary education, respectively. Nearly 87% of respondents are ethnic Chinese, and 79% of them are married. The average number of children is 2.9, while the average number of people living together in the same household is 2.6. About 48% and 8% of the respondents were employed for a paid job or self-employed, respectively. Among the employed respondents, 71% were full-time workers with average monthly labor income of S\$3,642. The average total monthly consumption spending and total household monthly income were S\$2,998 and S\$4,797, respectively. About 65% of individuals ever had any chronic health condition(s). Column (2) describes the summary statistics for those aged 50–64 used for the labor market analysis. By construction, they are younger than the full sample and thus have a lower probability of having chronic health conditions. Otherwise, they have similar demographics. Those aged 50–64 are more likely to work and thus their total consumption spending, total household income and labor income are, on average, larger than those in column (1).

#### 4. Empirical Strategy

To identify the impact of the COVID-19 outbreak, we examine how consumption spending and labor market outcomes evolved relative to January 2020, as Singapore’s first case was confirmed on January 23, 2020. Since about 90% of respondents had completed the January survey by that date, January 2020 serves as a reference period. Specifically, we use the changes in the outcome variables of the same individuals during the period from July 2018 to May 2019 (i.e., the same months but a year ago) to analyze what would have happened in the absence of the pandemic. To implement this research design, we consider the following DID specification:

$$y_{i,t} = \beta_0 + \beta_1 Season_t + \sum_{k \neq Jan} \beta_k 1[Mth_t = k] Season_t + Mth_t + \lambda_i + X'_{i,t} \gamma + \varepsilon_{i,t} \quad (1)$$

where  $y_{i,t}$  represents an outcome variable of interest of household (for consumption spending

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<sup>12</sup> However, the results, presented in Table A4, remain robust when we do not impose such a restriction on the sample.

and household income) and individual  $i$  (for labor market outcomes and risk avoidance behavior and subjective expectation) in month  $t$ .  $Mth_t$  are month dummies.  $Season_t$  is a dummy variable indicating if the observed period is the 2019/2020 season.  $\lambda_i$  denotes individual fixed effects.  $X_{i,t}$  includes the above-mentioned control variables.  $\beta_k$ s are the parameters of interest, which capture the impact of COVID-19 on consumption spending and labor market outcomes during each month evaluated against those in January. For statistical inference, we calculate standard errors clustered at the household level for consumption spending and household income and at the individual level for labor market outcomes and other individual-level outcomes.

The key identification assumption of the DID specification is that the trends of outcome variables are parallel between the two seasons in the absence of the COVID-19 pandemic. To indirectly test this assumption, we examine if  $\beta_k$ s, in which  $k$  refers to the months from July to December, are close to zero in magnitude and statistically insignificant.

## 5. Results

### 5.1. Short-term impact of COVID-19 on consumption spending and labor market outcomes

Figure 1 shows the DID estimates for the impact of COVID-19 on consumption spending.<sup>13</sup> Panel A indicates that the estimated changes in total consumption spending are mostly small in magnitude and statistically insignificant until January, which provides evidence of the parallel pre-pandemic trends. Subsequently, total household consumption spending began to decline from February 2020 onward. The magnitude of decrease in total household consumption spending in February, March, and April are 7.3%, 9.0%, and 22.8%, respectively.<sup>14</sup> The initial decline in total household spending in February and March indicates individuals' spontaneous risk avoidance behavior, and the large decline in total household spending during April is likely to reflect the spike in the number of confirmed cases and the lockdown policy.

In panels B and C, we examine consumption spending responses on durable and non-durable (including services) goods. We find that durable goods spending remained constant

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<sup>13</sup> The corresponding regression results are reported in panel A of Table A2. The trends of consumption spending (both in logarithm and levels) are reported in Figure A2.

<sup>14</sup> Results on consumption spending, available upon request, are similar when we restrict the sample to households with the financial respondent aged 50–64.

until March but declined by 21.4% in April. The late decline in durable goods spending is likely because consumers cannot physically go to stores to inspect durable goods such as home appliances and furniture prior to purchasing due to the partial lockdown imposed in April 2020. By contrast, spending on non-durables decreased by 7.9% and 9.6% in February and March, respectively, and 22.2% in April. Figure A3 shows that the estimated cutback in consumption spending varied across the sub-categories.<sup>15</sup> For example, there were substantial declines in entertainment (-83%) as well as tours and vacations (-153%). By contrast, spending on food and beverages purchased from grocery stores and supermarkets increased by 13.6%, while spending on food and beverages purchased from restaurants and food courts decreased by 32.2%.

Figure 2 shows the DID estimates for the impact of COVID-19 on labor market outcomes.<sup>16</sup> Panels A and B indicate that the estimated changes in the probability of employment and self-employment are small in magnitude and statistically insignificant until January, which provides evidence of the parallel pre-pandemic trends. Although we find little evidence that COVID-19 reduced self-employment, the employment rate went down by 2.3 pp in May. Compared with other countries (Adams-Prassl et al. 2020; Béland, Brodeur, and Wright 2020; Béland et al. 2020), this 2.3 pp decline in employment rate is relatively modest, which is likely due to the government's massive wage support programs. For example, it provided up to 25–75% of the first S\$4,600 of gross wages of each local employee in a ten-month period depending on the sector. It also provided an income relief scheme for the self-employed via monthly cash payouts of S\$1,000 for 9 months. We acknowledge that our sample respondents are older than the average population. Thus, the negative labor market impact may not be as large as that for the younger population.

In Panel C, we find that the probability of working full-time (conditional on working) decreased by 1.2 pp and 6.0 pp in April and May, respectively. In Panel D, monthly labor income (conditional on working) decreased by 1.7%, 1.9%, and 5.9% in February, March, and April, respectively. The results suggest that the intensive margin of labor inputs is affected by

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<sup>15</sup> We calculate the percent change for each subcategory between January and April 2020. We first estimate equation (1) using consumption spending by category in levels. Next, we divide the estimated coefficient estimates of April 2020 by average spending in the same category in January 2020. Hence, it is possible that the calculated percent change could be larger than 100%. We use the regression of consumption spending in levels instead of logarithm due to the presence of many zero values, especially for durables and items like tours, entertainment, and petrol (car ownership rate in Singapore is only about 11%).

<sup>16</sup> The corresponding regression results are reported in Table A3. The trends of labor market outcomes are reported in Figure A4. The results using the full sample, regardless of age, are available in Table A4. They are similar when we do not impose the age restriction.

COVID-19 more than the extensive margin. Although data on labor income in May are not yet available, reduction in income is expected to be larger given the larger impact on working hours in May.

## 5.2. Heterogeneity analysis by pre-pandemic health status and household net worth

In Figure 3, we investigate heterogeneous consumption responses to COVID-19 based on whether any SLP respondent in the household has any chronic health condition(s) and the average total household net worth from January 2018 to January 2020. First, we estimate the heterogeneous consumption responses by whether household members have any chronic conditions to investigate if consumption responses were greater among respondents who are physically more vulnerable. Panel A indicates little difference in the consumption responses to COVID-19 by chronic health conditions.<sup>17</sup> Although this finding is surprising, we argue that it can be attributed to the following reasons: i) Since the respondents in the SLP are older, their desire to avoid the coronavirus infection may be similar regardless of their pre-existing chronic conditions, and ii) Given the low case-fatality rate in Singapore, households' consumption responses are likely to be affected more by other factors, such as lockdown policy, changes in expectations and precautionary motives, but less by actual health threats.

Second, we estimate heterogeneous consumption responses by wealth (measured by household net worth), because low-wealth (below the median) households may experience severe financial hardships during any economic crisis and thus reduce their expenditures relatively more. However, Panel B shows 5.7% greater reductions in consumption spending among households with higher wealth (the median and above) in April 2020. The possible explanations for this result are i) high-wealth households reduce discretionary spending such as travel, sports, and entertainment;<sup>18</sup> ii) return to health capital may be higher among richer groups, and thus they have a stronger incentive to avoid the virus and reduce consumption spending; and iii) those with higher wealth tend to have better health literacy and may minimize consumption that involves close personal interactions. In Panels A to C of Figure A5, we show evidence consistent with our conjectures. These results imply that saving can increase disproportionately by wealth. We test and confirm this hypothesis as shown in Panel D of Figure A5.

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<sup>17</sup> The results, available upon request, are similar when estimating heterogeneous effects by age.

<sup>18</sup> Discretionary spending includes entertainment, sports, hobby, tour, public transportation, petrol, clothing, and home repair and maintenance. The results are robust if we further include durables in discretionary spending.

In Figure 4, we investigate heterogeneous effects on labor market outcomes among those aged 50–64. Panel A illustrates little heterogeneity in the impact of COVID-19 on the probability of self-employment, full-time work status, and monthly labor income by underlying health status. However, the employment rate decreased in May among healthier workers (-3.2 pp) but not among sicker workers, which contradicts our prior belief that sicker people might reduce labor supply more to avoid infection. A possible explanation is that females are 6% less likely to have chronic conditions and they tend to work in the sectors more severely affected by the pandemic (Alon et al. 2020). Panel B indicates that the pandemic reduced monthly labor income and employment probability more severely among low-wealth individuals, while it presents little heterogeneity in the probability of self-employment and full-time work status by individuals' wealth level. These results demonstrate that low-wealth workers suffered more from negative labor market shocks brought by COVID-19 (Adams-Prassl et al. 2020; Béland, Brodeur, and Wright 2020; Béland et al. 2020).<sup>19</sup>

### 5.3. Mechanisms

We examine the mechanisms described in Section 2.2 to understand what drives the economic impact of COVID-19. Although we cannot test all possible mechanisms and quantify the relative importance of each, we exploit the rich information in the SLP and the COVID-19 pandemic timeline in Singapore to identify a few major mechanisms in Figure 5.

First, spending declines because fewer people leave their homes, attributable to individuals' risk avoidance behavior and the nationwide partial lockdown. Consistent with this conjecture, Panel A shows that individuals reduced the frequency of leaving their homes daily over the last month, which implies that they deliberately cutback on outside activities. This result is consistent with the large decline in spending on public transportation in Panel B. We attribute the initial decline in consumption spending in February and March 2020 mainly to individuals' own choice and the larger decline in April 2020 to a mix of individual choice and the government's lockdown policy.

Second, individuals become more uncertain about the future and have an incentive to increase precautionary savings. Consistent with this conjecture, Panel C shows that the

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<sup>19</sup> Following Béland, Brodeur, and Wright (2020), we use O\*NET data to construct indices of i) exposure to disease or infections and ii) proximity to coworkers and other workers. Figure A6 indicates that the effects of COVID-19 on monthly labor income were greater among workers more exposed to disease or infections and with proximity to coworkers and other workers, while it shows little heterogeneity in probability of employment, self-employment, and full-time work status.



subjective probability of losing a job increased sharply in April and remained high in May 2020. In addition, Panel D provides evidence that households significantly increased saving following the outbreak of COVID-19, but we also acknowledge that this increase in saving could be also driven by risk avoidance behavior and government NPIs.<sup>20</sup>

Third, households can reduce consumption spending due to the unexpected decrease in total household income via a drop in labor income or other income sources. After the Singapore government introduced several income-support programs, the impact of COVID-19 on total household income may not be as severe as that of labor income. However, Panel E shows that household income still decreased much in April.<sup>21</sup> This result implies that the fall in total household income may explain part of the decrease in household consumption spending.

We discuss possible mechanisms on labor market outcomes. Since the observed results are equilibrium outcomes, it is difficult to disentangle the extent to which the reductions in labor market outcomes are driven by changes in labor demand or supply. Our baseline results indicate that the magnitude of reductions in labor income was larger than those of working hours, for example, the probability of full-time work status decreased by 1.2 pp (1.6%) in April, but labor income declined by 5.9%. This implies a decline in hourly wages. Since we observe decreases in wages and working hours, we conjecture that the changes in the labor market outcomes are dominated by a decrease in labor demand (at the intensive margin).

## 6. Conclusions

We examine the short-term impact of COVID-19 on consumption spending and labor market outcomes, using high-frequency individual-level panel data. First, we find that COVID-19 has reduced consumption spending substantially, with a larger response from high-wealth households. As possible mechanisms, reductions in consumption spending were associated with risk avoidance behavior, the nationwide lockdown policy, heightened economic uncertainty, and reduced income. Second, we document that COVID-19 has significantly reduced full-time work status and labor income but with modest changes in employment and

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<sup>20</sup> We do not report the results of using the logarithm value of saving, because about 20% of households report zero or negative saving. However, the results, available upon request, are robust when using the log-transformation of saving.

<sup>21</sup> Household total income is more fluctuating than labor income as it consists of four parts. Figure A7 shows the decomposition of household income by source. We can find the negative coefficients on household income before January is mainly driven by private transfers received from families, relatives, and friends, which tend to reach high in January.

little changes in self-employment. In addition, the reductions in labor income were much higher among low-wealth workers.

Our findings provide several policy implications. First, since consumption spending can respond even when health shocks were relatively mild during February and March 2020, it is important to contain the fear and spread of the virus and boost confidence in the economy to minimize the long-term consequences of adverse shocks brought by the pandemic to the economy. Second, the larger reduction in consumption spending by relatively high-wealth households suggests that uniform cash transfers may be less effective than transfers leaning towards low-income households. Finally, COVID-19 could widen income inequality via disproportionate effects on labor market outcomes. Hence, government stimulus policies, such as large-scale wage subsidies to employers targeting disadvantaged workers, could be effective in mitigating inequality and recovering the economy.

We acknowledge the limitations of our study. First, we focus on the short-term economic impact of COVID-19. Investigating its longer-term impact would be an interesting avenue for future research for a comprehensive understanding of the evolution of the pandemic responses and the role of stimulus policies. Second, our analysis focuses on older individuals, who are the most vulnerable population to the novel coronavirus in terms of health impact. Given the lack of access to data covering the entire population of Singapore, one should be cautious about generalizing our study results to younger groups.<sup>22</sup>

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<sup>22</sup> Regarding consumption spending, our estimates can be underestimated since some of older households are retired and thus are less likely to experience income reductions. To examine this issue, we estimate heterogeneous effects on consumption spending by age because younger individuals are more likely to stay in the labor market. The results, however, indicate little heterogeneity in consumption spending responses, implying that our baseline estimates are less likely to be understated.

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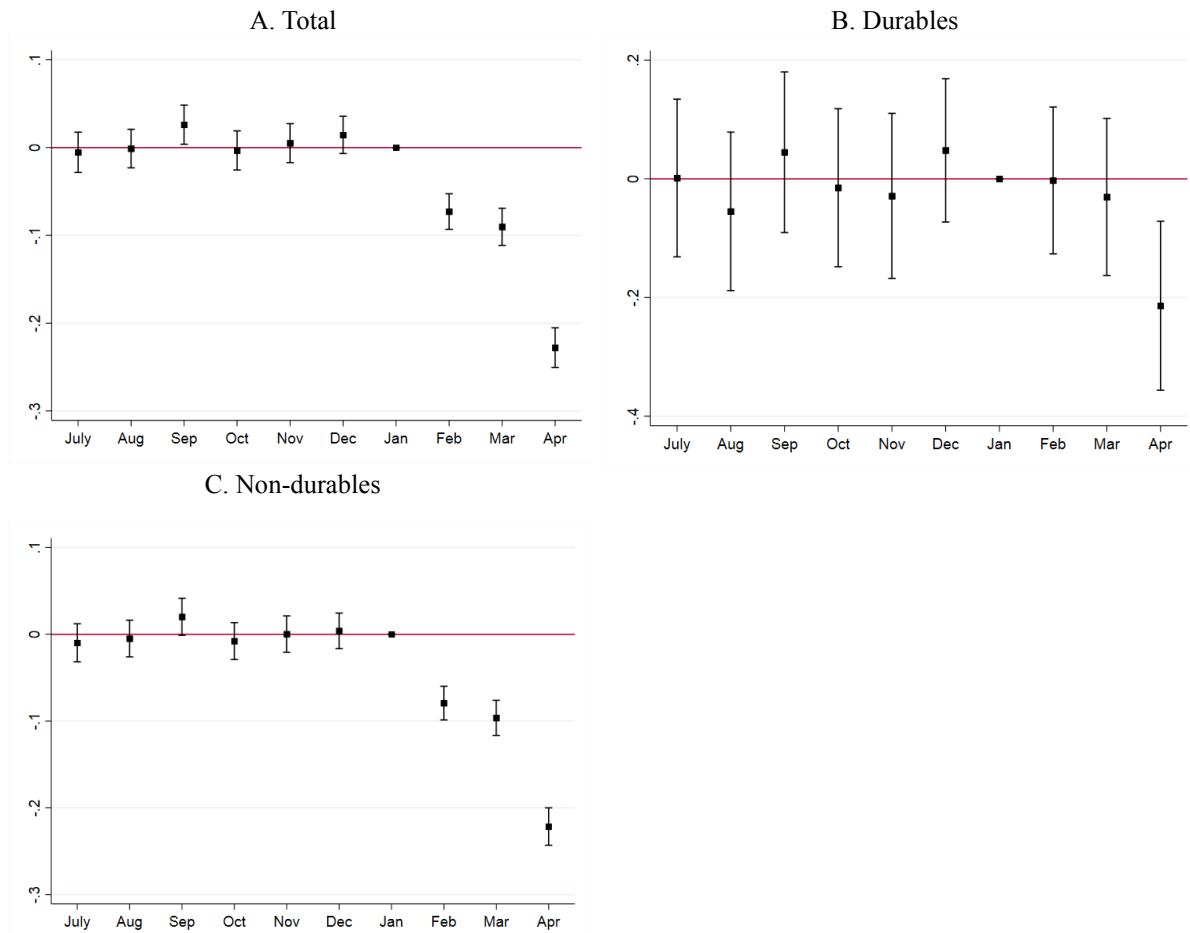
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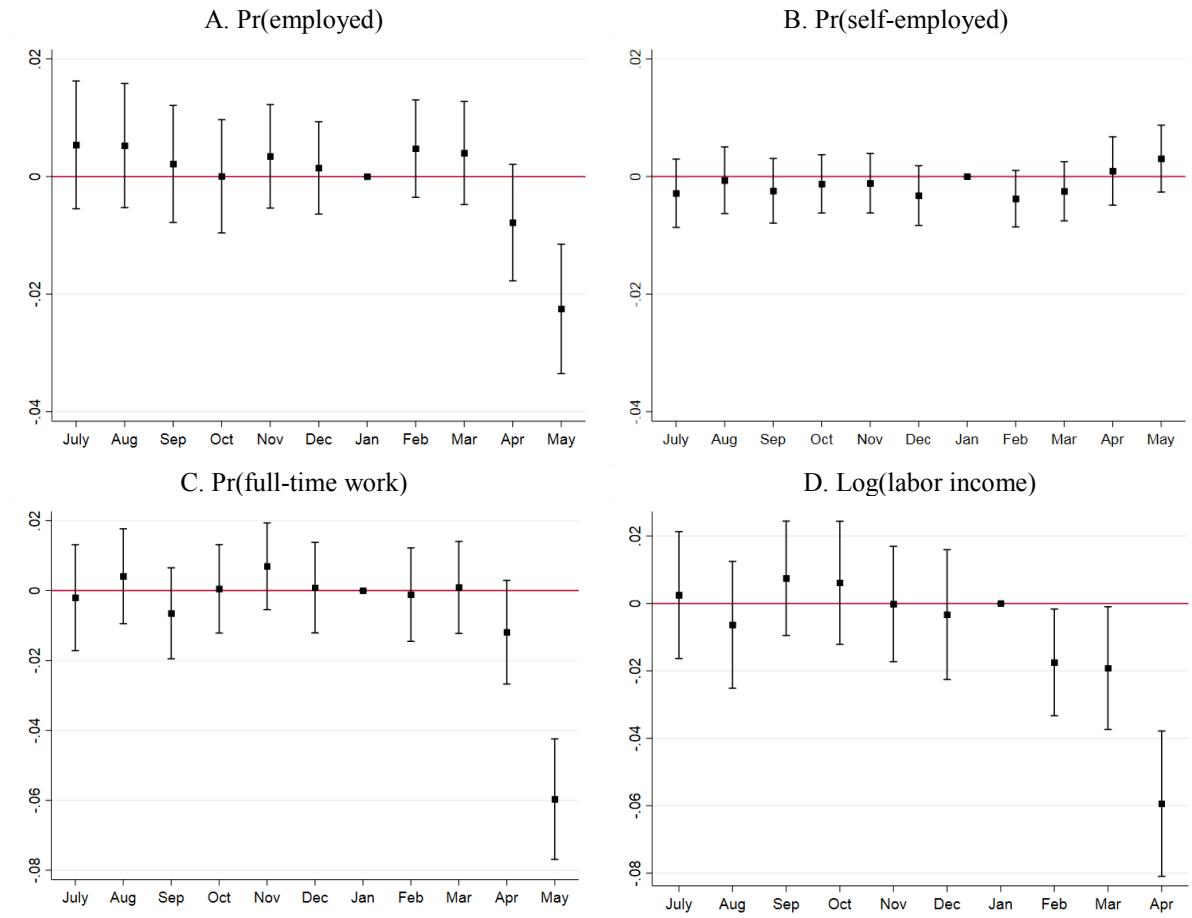
## Figures

Figure 1. Short-term impact of COVID-19 on household consumption spending



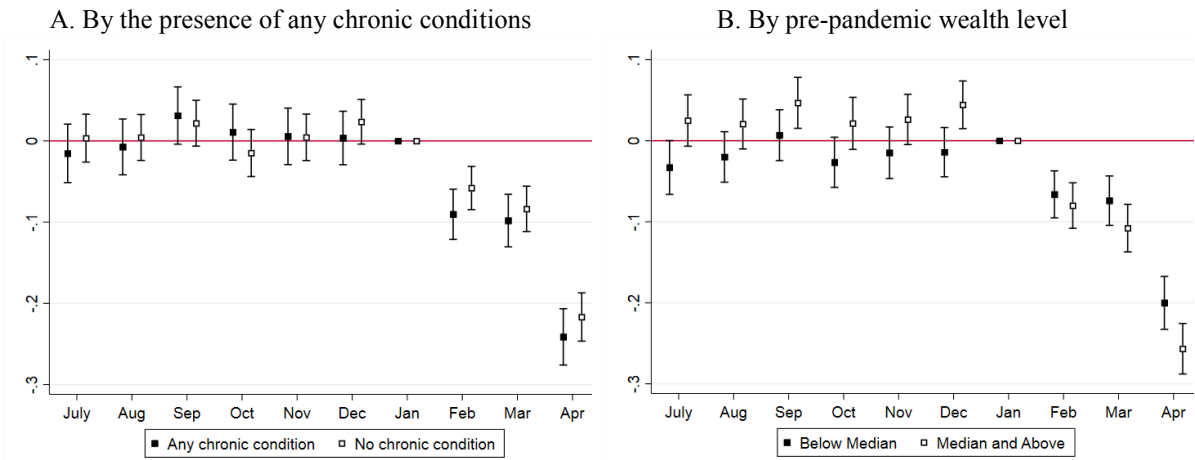
Notes: The dependent variables are log transformed. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the household level and corrected for heteroskedasticity.

Figure 2. Short-term impact of COVID-19 on labor market outcomes



Notes: The sample is restricted to those who are aged 50-64 as of May 2020. Monthly incomes are log transformed. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the household level and corrected for heteroskedasticity.

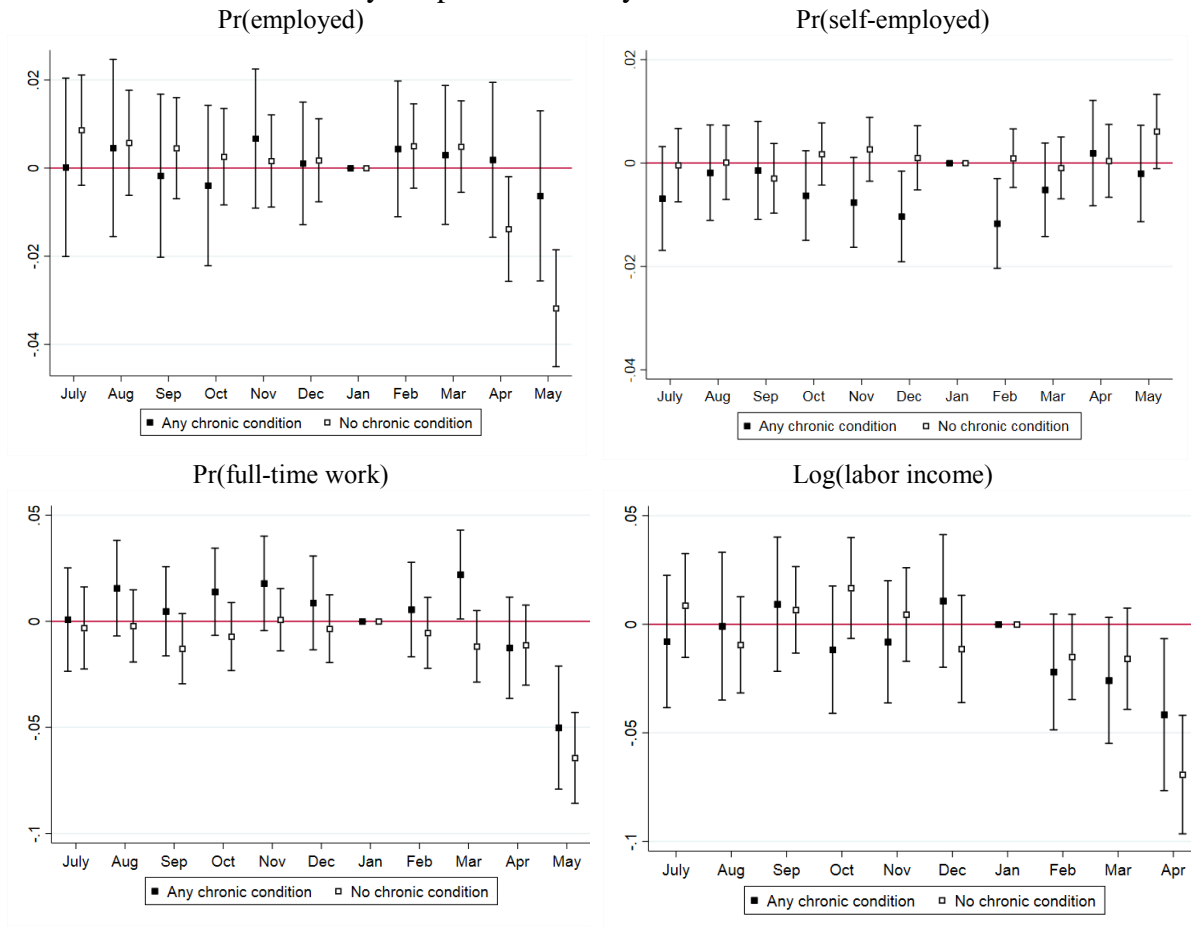
Figure 3. Heterogeneous impact of COVID-19 on total consumption spending



Notes: The dependent variables are log transformed. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the household level and corrected for heteroskedasticity.

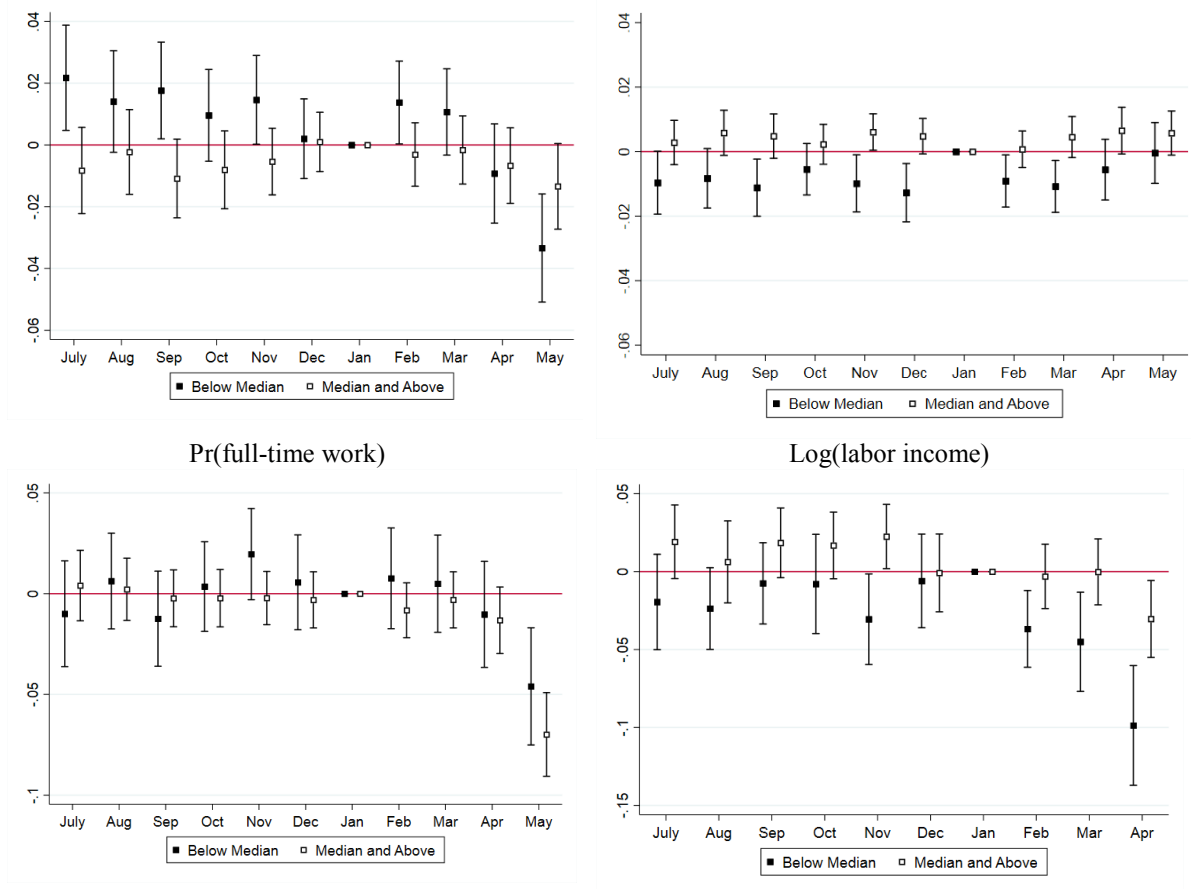
Figure 4. Heterogeneous impact of COVID-19 on labor market outcomes

A. By the presence of any chronic conditions



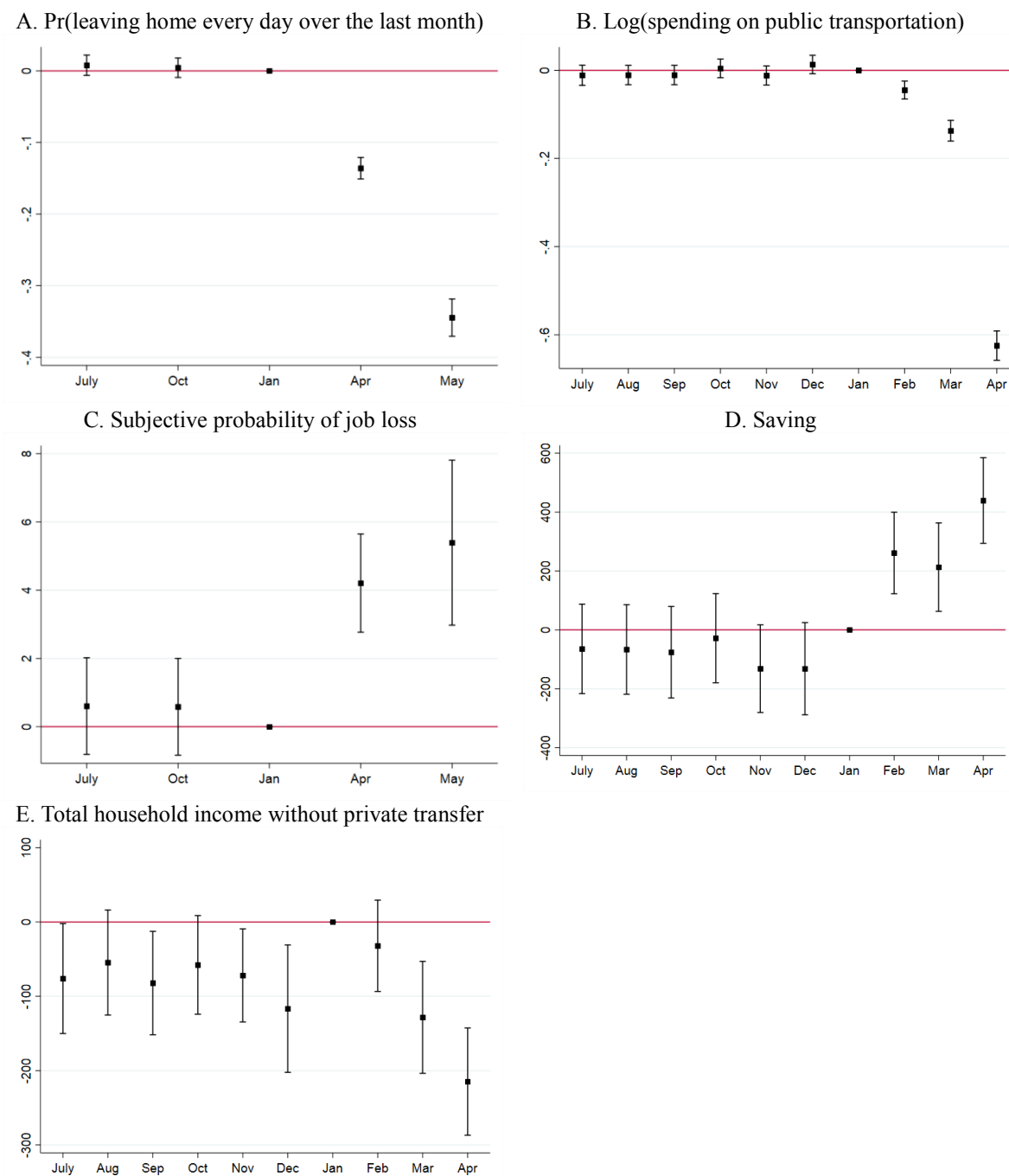


B. By pre-pandemic household wealth level



Notes: The sample is restricted to those who are aged 50-64 as of May 2020. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the individual level and corrected for heteroskedasticity.

Figure 5. Mechanisms

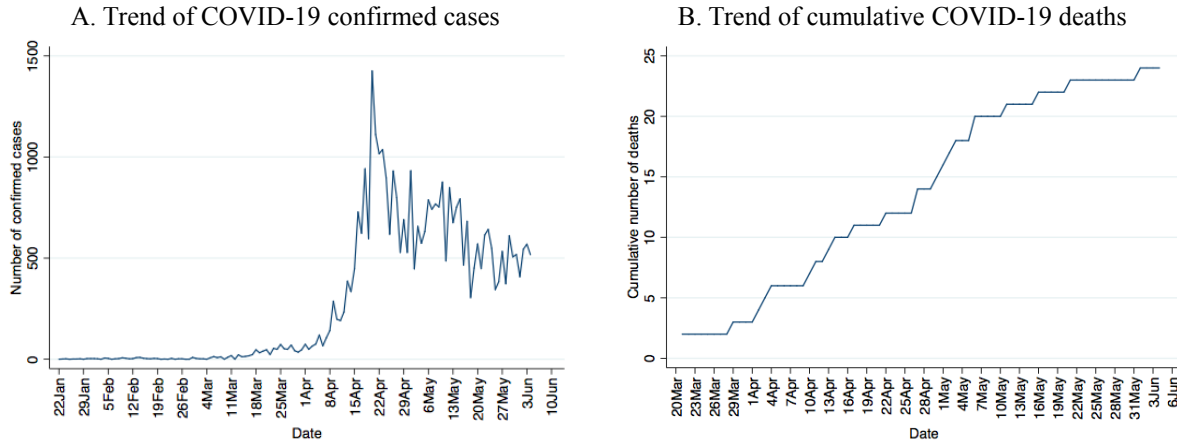


Notes: Total household income without private transfer includes three parts: household financial respondents' own income, their spousal income, and household other incomes. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the household level for panels B, D and E and at the individual level for A and C and corrected for heteroskedasticity.

## Appendix

### A. Appendix Figures and Tables

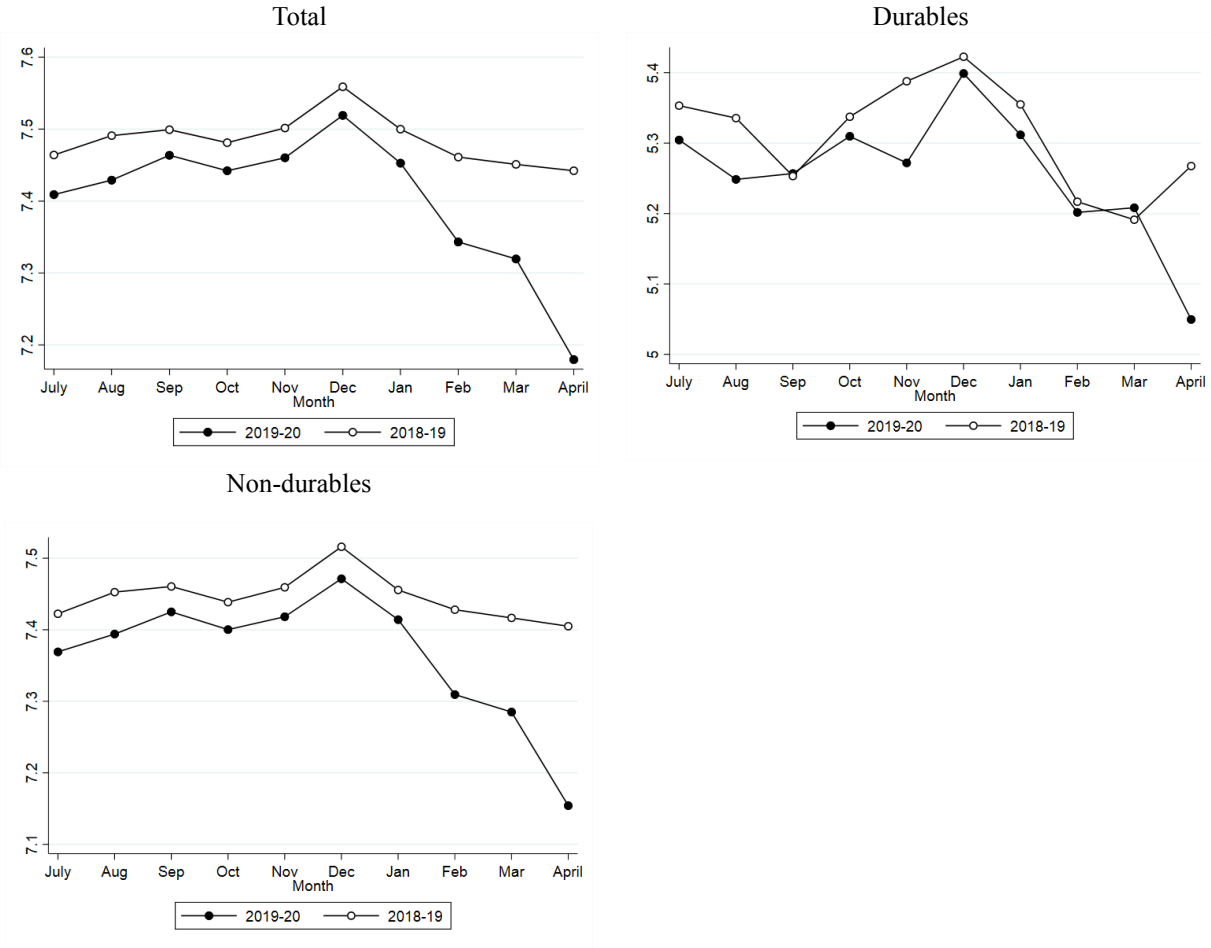
Figure A1. Spread of COVID-19 in Singapore



Source: Singapore Ministry of Health (2020).

Figure A2. Trends of Household Consumption Spending

A. Logarithm value of consumption spending



## B. Consumptions spending (in levels)

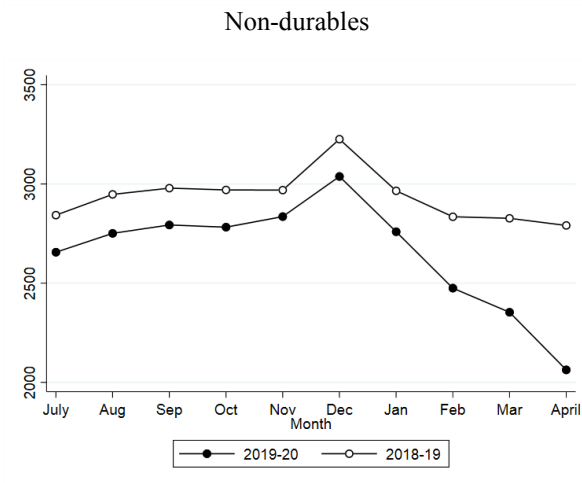
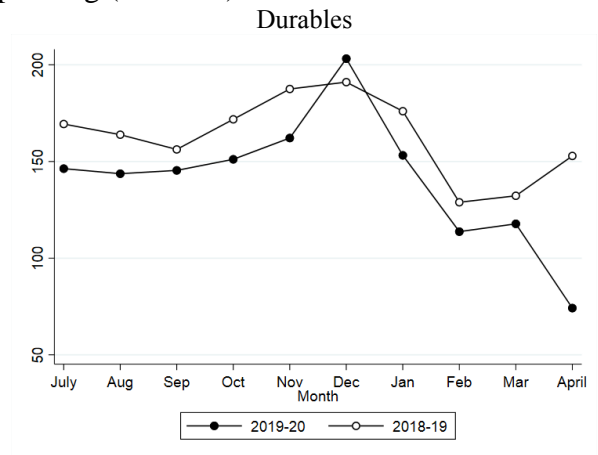
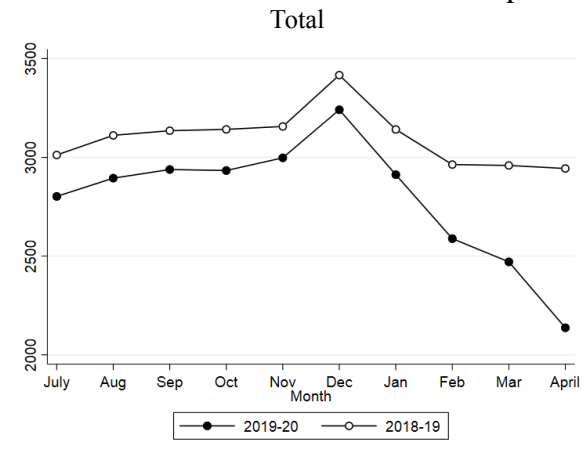
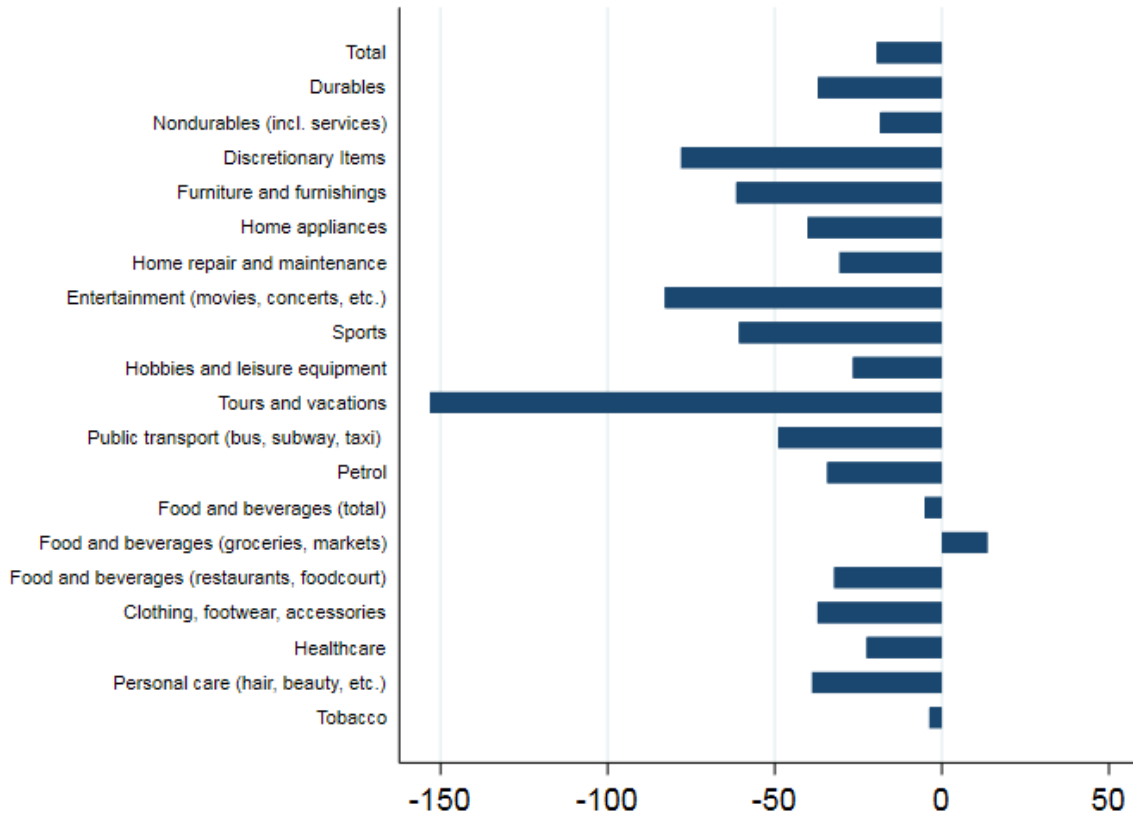
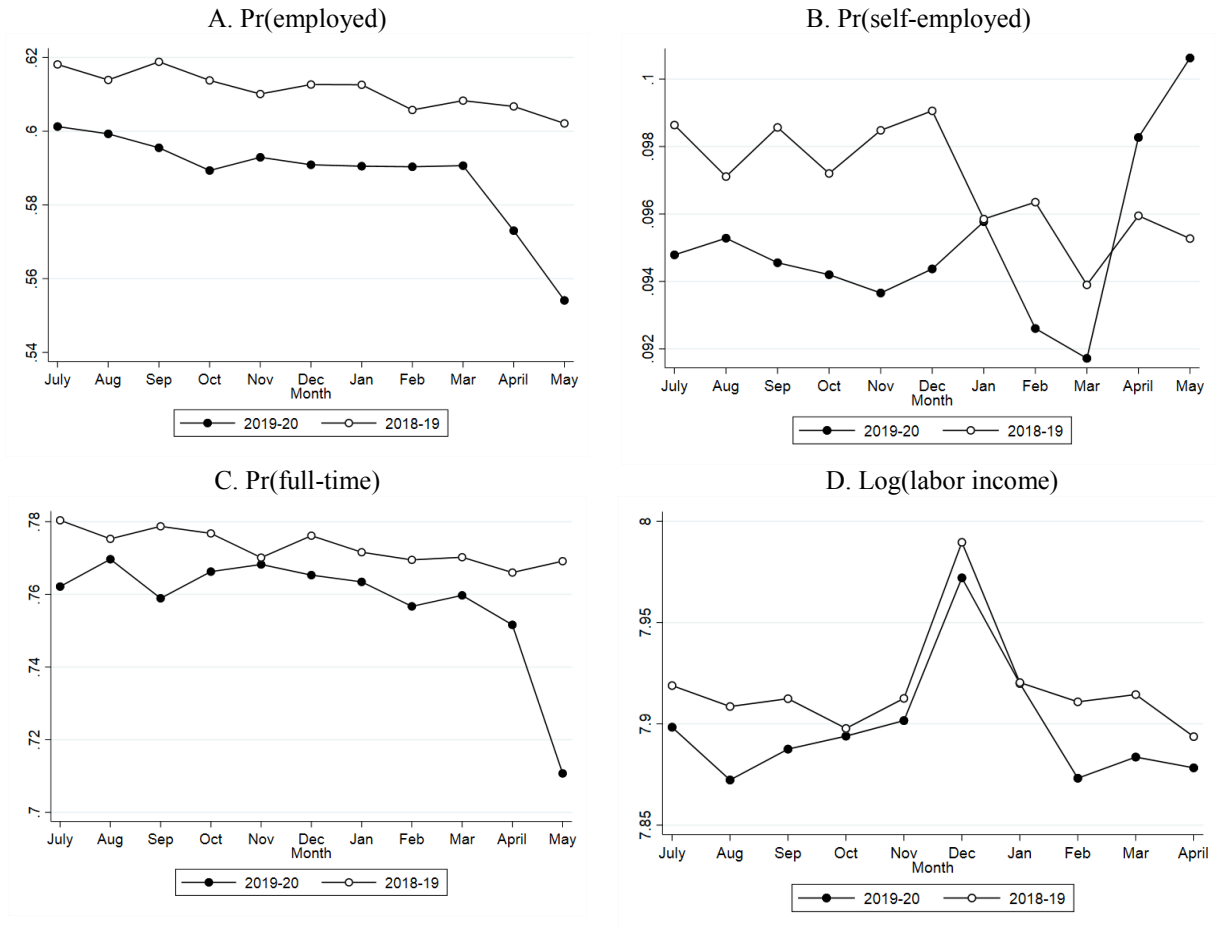


Figure A3. Percent Change in Spending By Category



Note: Percent change is computed as the estimated spending change in April 2020 using equation (1) (in levels) divided by mean spending in January 2020.

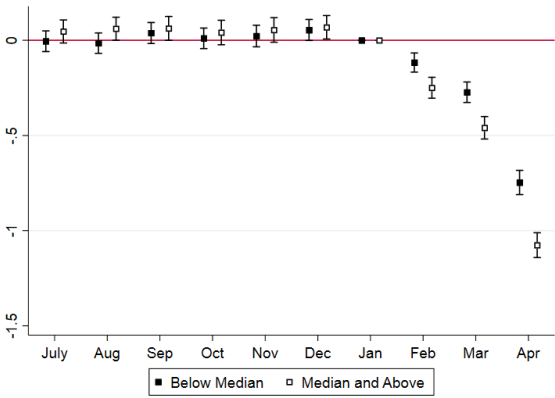
Figure A4. Trends of labor market outcomes



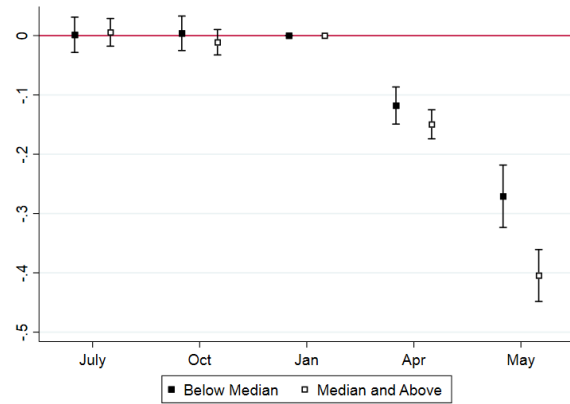
Note. The sample is restricted to those who are aged 50-64 as of May 2020.

Figure A5. Mechanisms for heterogenous consumption spending responses by wealth

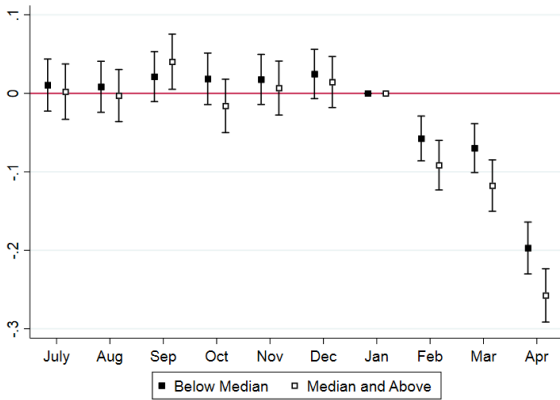
A. Discretionary spending by household net worth



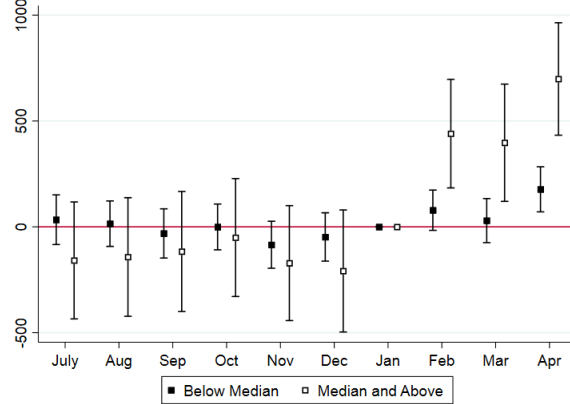
B. Pr(leaving home daily over the last month) by household net worth



C. Total household spending by health literacy



D. Savings by household net worth

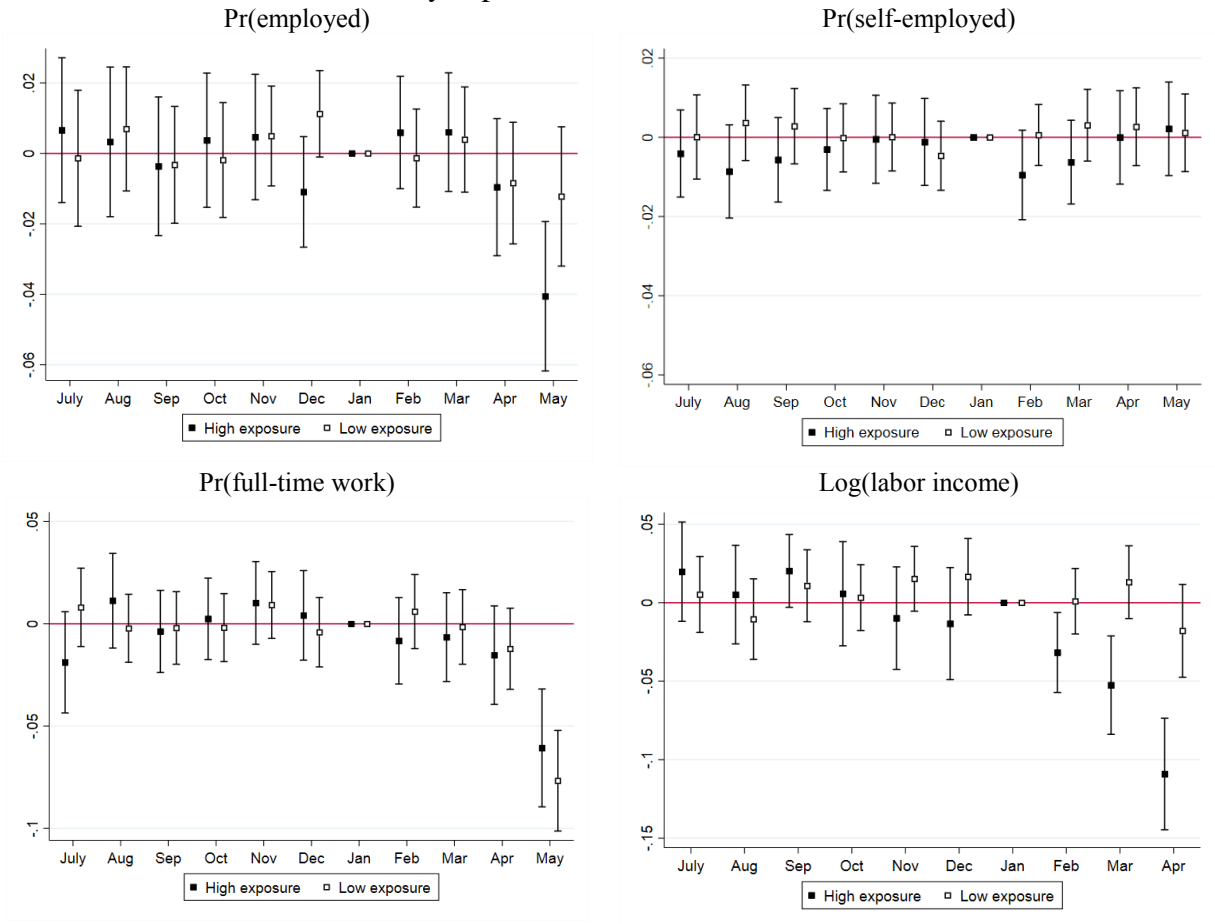


Notes. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the household level for Panels A, C, and D, and at the individual level for Panel B and corrected for heteroskedasticity. Discretionary spending includes entertainment, sports, hobby, tour, public transportation, petrol, clothing, and home repair and maintenance. The results are robust if we further include durables in discretionary spending. The Pearson correlation between an individual's health literacy and her household net worth is 0.31.

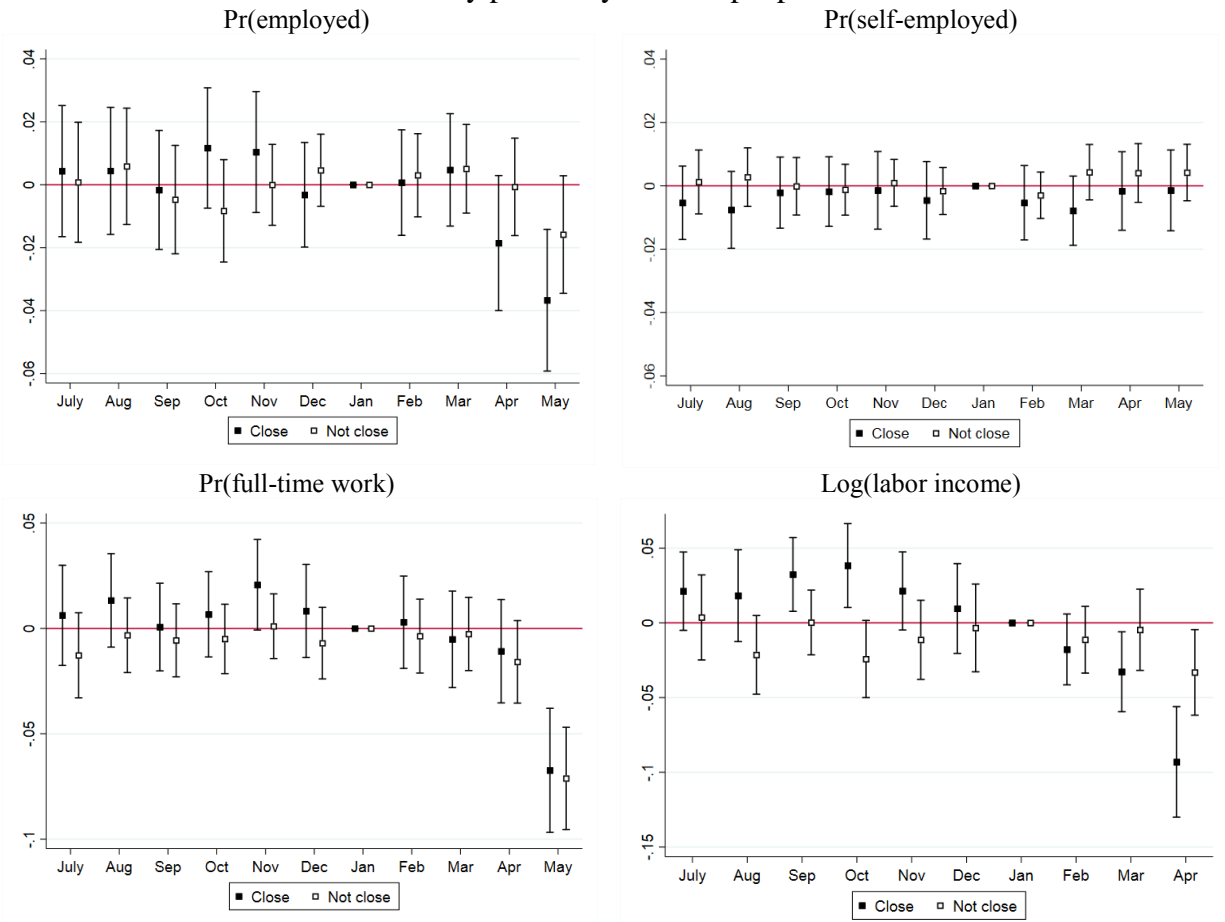


Figure A6. Heterogeneous impact of COVID-19 on labor market outcomes by work context

A. By exposure to disease or infection

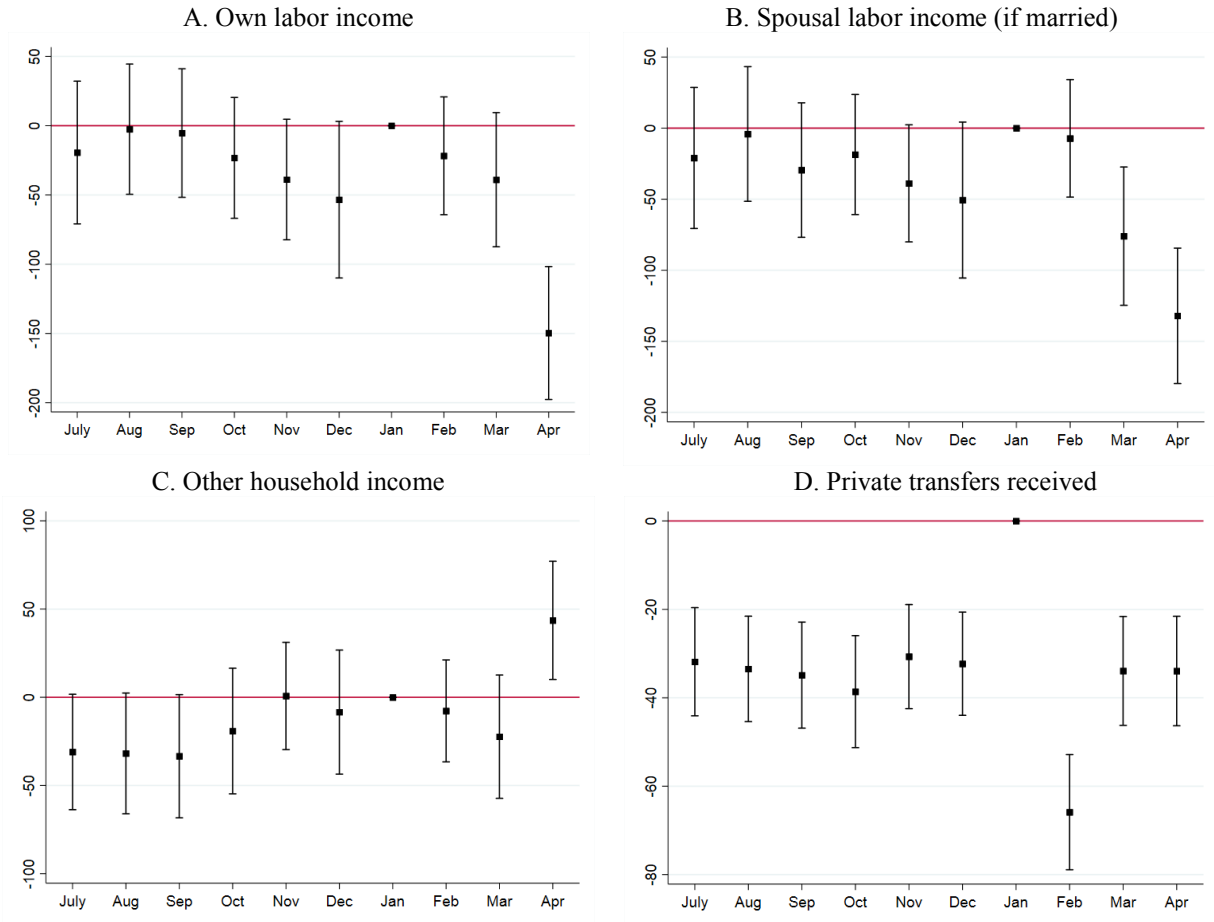


## B. By proximity to other people



Notes. The sample is restricted to those who are aged 50-64 as of May 2020. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the individual level and corrected for heteroskedasticity. O\*NET survey question used for the index of exposure to disease asking “How often does this job require exposure to disease or infections?”, and the survey question used for the proximity to coworkers or other workers asking “To what extent does this job requires the worker perform job tasks in close proximity to other people?” We define an individual is more exposed to disease or work with proximity to other people if reported scores to survey questions are greater than the median scores of each index.

Figure A7. Household income by source



Notes. We use income reported by household financial respondents. Zero incomes are included in all of the four sources. Square dots represent point estimates. Caps indicate 95% confidence intervals. Standard errors are clustered at the household level and corrected for heteroskedasticity.

Table A1. Pre-COVID-19 Summary Statistics (as of January 2020)

|                                | All sample<br>Mean (SD)<br>(1) | Subsample aged 50-<br>64 as of May 2020<br>Mean (SD)<br>(2) |
|--------------------------------|--------------------------------|---|
| Age                            | 63.2 (6.40)                    | 59.4 (3.10)   |
| Completed secondary education  | .42 (.49)                      | .43 (.49)   |
| Completed tertiary education   | .36 (.48)                      | .40 (.49)   |
| Ethnic Chinese                 | .87 (.34)                      | .87 (.34)   |
| Married                        | .79 (.41)                      | .81 (.39)   |
| Number of children             | 2.92 (1.14)                    | 2.84 (1.13)   |
| Household size                 | 2.55 (1.38)                    | 2.73 (1.34)   |
| Employed (working for pay)     | .48 (.50)                      | .59 (.49)   |
| Self-employed                  | .08 (.27)                      | .10 (.29)   |
| Full-time work                 | .71 (.45)                      | .76 (.43)   |
| Household consumption spending | 2998 (3652)                    | 3518 (4051)   |
| Household net worth            | 1,175,899<br>(1,628,542)       | 1,234,076<br>(1,620,430)                                    |
| Household total income         | 4797 (5331)                    | 5835 (5963)   |
| Own labor income               | 3642 (3965)                    | 4046 (4192)   |
| Having any chronic condition   | .65 (0.48)                     | .58 (0.49)  |
| Number of individuals          | 7569                           | 4290  |

Notes: The statistics are based on the SLP wave collected in January 2020. Monetary units are in 2019 Singapore dollars.

Table A2. Short-run impact of COVID-19 on household consumption spending

A. Dependent variable: Log (consumption spending)

|                  | Total spending<br>(1) | Durable spending<br>(2) | Non-durable spending<br>(3) |
|------------------|-----------------------|-------------------------|-----------------------------|
| Season×July      | -0.005<br>(0.012)     | 0.001<br>(0.068)        | -0.010<br>(0.011)           |
| Season×August    | -0.001<br>(0.011)     | -0.055<br>(0.068)       | -0.005<br>(0.011)           |
| Season×September | 0.026**<br>(0.011)    | 0.045<br>(0.069)        | 0.020*<br>(0.011)           |
| Season×October   | -0.003<br>(0.011)     | -0.015<br>(0.068)       | -0.008<br>(0.011)           |
| Season×November  | 0.005<br>(0.011)      | -0.029<br>(0.071)       | 0.000<br>(0.011)            |
| Season×December  | 0.014<br>(0.011)      | 0.048<br>(0.062)        | 0.004<br>(0.010)            |
| Season×February  | -0.073***<br>(0.010)  | -0.003<br>(0.063)       | -0.079***<br>(0.010)        |
| Season×March     | -0.090***<br>(0.011)  | -0.031<br>(0.067)       | -0.096***<br>(0.010)        |
| Season×April     | -0.228***<br>(0.012)  | -0.214***<br>(0.073)    | -0.222***<br>(0.011)        |
| Observations     | 98,699                | 26,634                  | 98,685                      |
| R-squared        | 0.862                 | 0.490                   | 0.867                       |

Notes: Standard errors are clustered at the household level and corrected for heteroskedasticity. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

B. Dependent variable: Consumption spending (in levels)

|                  | Total spending<br>(1) | Durable spending<br>(2) | Non-durable spending<br>(3) |
|------------------|-----------------------|-------------------------|-----------------------------|
| Season×July      | 68.13<br>(56.77)      | 4.739<br>(17.74)        | 63.39<br>(53.46)            |
| Season×August    | 79.54<br>(58.60)      | 7.940<br>(18.00)        | 71.60<br>(55.51)            |
| Season×September | 91.52<br>(62.59)      | 14.35<br>(17.85)        | 77.17<br>(60.09)            |
| Season×October   | 24.77<br>(60.20)      | 4.490<br>(18.21)        | 20.28<br>(56.90)            |
| Season×November  | 109.3*<br>(59.73)     | 2.167<br>(19.02)        | 107.2*<br>(56.30)           |
| Season×December  | 80.66<br>(56.61)      | 37.28**<br>(17.26)      | 43.38<br>(54.22)            |
| Season×February  | -154.4***<br>(52.47)  | 8.477<br>(14.36)        | -162.9***<br>(50.26)        |
| Season×March     | -254.9***<br>(54.71)  | 9.270<br>(15.93)        | -264.2***<br>(51.97)        |
| Season×April     | -567.2***<br>(52.79)  | -56.91***<br>(16.99)    | -510.3***<br>(49.60)        |
| Observations     | 98,699                | 98,699                  | 98,699                      |
| R-squared        | 0.727                 | 0.213                   | 0.724                       |

Notes: Standard errors are clustered at the household level and corrected for heteroskedasticity. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table A3. Short-run impact of COVID-19 on labor market outcomes

|                  | Pr(employed)<br>(1)  | Pr(self-employed)<br>(2) | Log(labor income)<br>(3) | Pr(full-time work)<br>(4) |
|------------------|----------------------|--------------------------|--------------------------|---------------------------|
| Season×July      | 0.005<br>(0.006)     | -0.003<br>(0.003)        | 0.002<br>(0.010)         | -0.002<br>(0.008)         |
| Season×August    | 0.005<br>(0.005)     | -0.001<br>(0.003)        | -0.006<br>(0.010)        | 0.004<br>(0.007)          |
| Season×September | 0.002<br>(0.005)     | -0.002<br>(0.003)        | 0.007<br>(0.009)         | -0.007<br>(0.007)         |
| Season×October   | 0.000<br>(0.005)     | -0.001<br>(0.003)        | 0.006<br>(0.009)         | 0.001<br>(0.006)          |
| Season×November  | 0.003<br>(0.004)     | -0.001<br>(0.003)        | -0.000<br>(0.009)        | 0.007<br>(0.006)          |
| Season×December  | 0.001<br>(0.004)     | -0.003<br>(0.003)        | -0.003<br>(0.010)        | 0.001<br>(0.007)          |
| Season×February  | 0.005<br>(0.004)     | -0.004<br>(0.002)        | -0.017**<br>(0.008)      | -0.001<br>(0.007)         |
| Season×March     | 0.004<br>(0.004)     | -0.003<br>(0.003)        | -0.019**<br>(0.009)      | 0.001<br>(0.007)          |
| Season×April     | -0.008<br>(0.005)    | 0.001<br>(0.003)         | -0.059***<br>(0.011)     | -0.012<br>(0.008)         |
| Season×May       | -0.023***<br>(0.006) | 0.003<br>(0.003)         |                          | -0.060***<br>(0.009)      |
| Observations     | 93,135               | 93,135                   | 54,840                   | 55,805                    |
| R-squared        | 0.862                | 0.893                    | 0.915                    | 0.815                     |

Notes: We restricted the sample to those aged 50-64 as of May 2020. Standard errors are clustered at the individual level and corrected for heteroskedasticity. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table A4. Short-run impact of COVID-19 on labor market outcomes  
*Using the full sample*

|                  | Pr(employed)<br>(1)  | Pr(self-employed)<br>(2) | Log(labor income)<br>(3) | Pr(full-time work)<br>(4) |
|------------------|----------------------|--------------------------|--------------------------|---------------------------|
| Season×July      | 0.004<br>(0.004)     | -0.001<br>(0.002)        | -0.010<br>(0.009)        | -0.000<br>(0.007)         |
| Season×August    | 0.002<br>(0.004)     | 0.000<br>(0.002)         | -0.016*<br>(0.009)       | 0.001<br>(0.006)          |
| Season×September | 0.001<br>(0.004)     | 0.000<br>(0.002)         | -0.004<br>(0.008)        | -0.002<br>(0.006)         |
| Season×October   | -0.001<br>(0.004)    | 0.000<br>(0.002)         | -0.002<br>(0.009)        | 0.003<br>(0.006)          |
| Season×November  | -0.002<br>(0.003)    | 0.001<br>(0.002)         | -0.013*<br>(0.008)       | 0.004<br>(0.006)          |
| Season×December  | 0.002<br>(0.003)     | -0.001<br>(0.002)        | -0.014<br>(0.009)        | 0.002<br>(0.006)          |
| Season×February  | 0.004<br>(0.003)     | -0.001<br>(0.002)        | -0.012<br>(0.008)        | 0.000<br>(0.006)          |
| Season×March     | 0.004<br>(0.003)     | 0.000<br>(0.002)         | -0.031***<br>(0.008)     | -0.005<br>(0.006)         |
| Season×April     | -0.008**<br>(0.004)  | 0.003<br>(0.002)         | -0.072***<br>(0.010)     | -0.013*<br>(0.007)        |
| Season×May       | -0.025***<br>(0.004) | 0.003<br>(0.002)         |                          | -0.061***<br>(0.008)      |
| Observations     | 165,839              | 165,839                  | 79,316                   | 80,779                    |
| R-squared        | 0.875                | 0.891                    | 0.915                    | 0.822                     |

Notes: Standard errors are clustered at the individual level and corrected for heteroskedasticity. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



## B. Details of the Singapore Government's Budget Measures in response to COVID-19

As of May 27, 2020, the Singapore government announced four budget measures: Unity Budget, Resilience Budget, Solidarity Budget, and Fortitude Budget.

The Unity Budget was announced on February 18, 2020 to distribute various types of family support measures. The size of the budget was S\$6.4 billion (US\$4.6 billion). The specifics of the support measures are as follows:

1. One-off cash payout from S\$100–\$300, depending on income
2. Additional \$100 cash payout for each parent with a child below 21
3. S\$100 Grocery Voucher for Singaporeans in need
4. S\$100 PAssion Card top-up for Singaporeans aged 50 years and above
- a. PAssion Card is a membership card that Singaporeans can use to pay for community center courses, public transport, grocery stores, and other places of interest such as the Singapore Zoo.
5. The value of regular voucher payments (GST Voucher - U-Save) for Singaporeans living in public housing doubled

The Resilience Budget was announced on March 26, 2020, as the coronavirus continued to spread in Singapore and the global economy nosedive into an unprecedented level of economic uncertainty. The budget size was S\$48.4 billion (US\$33.6 billion), which is seven times larger than the Unity Budget. The specifics of the support measures (among others) are as follows:

1. Amount of cash transfer announced in the Unity Budget tripled to S\$300-S\$900.
2. Additional cash payout for each parent with a child below 21 tripled, from \$100 to \$300
3. Enhanced Workfare Special Payment (Singapore's wage support program) of \$3,000 this year for low-wage workers
4. Grocery Voucher tripled for Singaporeans in need, from \$100 to \$300
5. \$100 PAssion Card top-up for Singaporeans aged 50 years and above in cash instead
6. One-year freeze on all government fees and charges, from April 1, 2020 to March 31, 2021
7. One-year suspension of university and polytechnic student loan repayment and interest charges, from June 1, 2020 to May 31, 2021
8. Three-month suspension of late payment charges on Housing and Development Board (HDB) mortgage arrears
9. Low- and middle- income workers (Singapore citizens and permanent residents aged 16 and above) who become unemployed between May and September 2020 will receive a monthly grant of S\$800 for three months while looking for a job or undergoing job training.
  - a. Applicants should have had a monthly household income of not more than S\$10,000, or per capita household income not more than S\$3,100 per month prior to unemployment and they should not live in a property with an annual value of not more than S\$21,000.
  - b. The self-employed and interns are not eligible

The Solidarity Budget measures were announced on April 6, 2020 as the grim situation continued. The size of the budget was S\$5.1 billion. The key component of this budget was an additional S\$300 cash payout for every adult Singaporean citizen in addition to the previously announced cash payments. The first cash payment of S\$600 was disbursed in April 2020 (bank transfers by April 14; checks by April 30), while the remainder of the cash payment will be disbursed in June 2020. The measures also include (but are not limited to) the following:

1. The government will fund 75% of the first S\$4,600 of gross monthly wages paid in April and May 2020 for every local worker
2. Eligible self-employed workers will receive three quarterly cash payments of S\$3,000 over three quarters in May, July, and October 2020.
3. Employers will receive waivers of Foreign Worker Levies (FWL) for hiring a low-skilled foreign worker amounting to S\$750 per month due in April and May 2020, and will be entitled to a rebate of S\$750 per month for levies paid in 2020 for each work permit or S-Pass holder.
4. The government's risk-share of loans for small and medium-sized enterprises (SMEs) to be raised from 80% to 90% (under the Temporary Bridging Loan Programme). SMEs can opt to defer principal payments until the end of 2020.

The Fortitude Budget measure of S\$33 billion was announced on May 26, 2020 (yet to be legislated). It expands the previous components of the government support for COVID-19 such as wage subsidies, foreign worker levy waiver. It also includes new measures such as creating jobs (traineeship programs), deferral of public pension contribution rate increase for senior workers, mandatory waiver of rents for SMEs badly hit by COVID-19. For details, visit <https://www.gov.sg/article/a-summary-of-the-fortitude-budget-2020>.

### C. Variables Definitions

#### Household spending

The SLP collects spending information for the following exclusive sub-categories (raw variable names are in parentheses).

1. Mortgage: interest and principal (c001)
2. Property tax (c002)
3. Home and content insurance (c003)
4. Rent (c004)
5. Utilities and other fuels: water supply, electricity, gas, other fuels, refuse disposal (c005)
6. Communication: internet, telephone, handphone, cable TV subscription (c006)
7. Furniture and furnishings: furniture, carpets, household textiles, glassware, tableware, household utensils (c007)
8. Home repair and maintenance: materials, tools, and services for maintenance and repair of home (c008)
9. Housekeeping supplies: cleaning and laundry products (c009)
10. Domestic and housekeeping services: cost of hiring maids, baby sitters, dry cleaning and laundry services. (c010)
11. Food and beverages (including alcohol): Purchased in grocery shops, provision shops, supermarkets, wet markets, or other stores (c011)

12. Dining and/or drinking out: in restaurants, cafes, pubs, hawker centers, food courts, coffee shops, canteens, street vendors, including take-away and home delivery food (c012)
13. Tobacco: cigarettes and other tobacco products (c013)
14. Clothing, footwear, jewelry, watches, accessories (c014)
15. Personal care products and services: including hair care, beauty, grooming, and skin products; spending on haircut, beauty treatment, manicure/pedicure, etc. (c015)
16. Health insurance: con\_hins (c016)
17. Prescription medications: out-of-pocket cost and anything paid from Medisave for prescription (c017)
18. Other medications: out-of-pocket cost and anything paid from Medisave for traditional medicines (e.g. Chinese and Ayurvedic medicine), over-the-counter medications, other medical products (e.g. wheelchair, crutches) and therapeutic equipment (c018)
19. Outpatient services: out-of-pocket cost and costs paid from Medisave for visits to doctors, traditional physicians (e.g. traditional Chinese physicians), physiotherapists, and psychologists; eye care and dental service fees; lab tests. (c019)
20. Hospital services: out-of-pocket cost and costs paid from Medisave for hospital and nursing home care (c020)
21. Home nursing: hiring costs of a helper due to health problems (do not include domestic help services) (c021)
22. Entertainment: including tickets to movies, sporting events, concerts, and museums. (c022)
23. Sports: including gym, exercise equipment such as bicycles, and boats, etc.(c023)
24. Hobbies and leisure equipment: including photography, stamps, reading materials (newspapers, magazines, books), camping, gardening, pets, electronic entertainment (e-magazines, e-books, iTunes, Netflix). (c024)
25. Package tours and vacations: including transportation, accommodation, and recreational expenses on tours and trips (c025)
26. Vehicle payments: interest and principal (c026)
27. Road use fees: road taxes, road use charges (e.g. ERP), parking including traffic / parking fines (c027)
28. Vehicle insurance (c028)
29. Petrol (c029)
30. Vehicle repair and maintenance, including VICOM inspection and other vehicle related services (c030)
31. Spending on public transportation including mass rapid transit (MRT; subway name in Singapore), taxi, bus (c031)
32. Home appliances (c032)
  - 1) Television
  - 2) DVD/BLURAY player and recorder
  - 3) Refrigerator
  - 4) Microwave
  - 5) Vacuum cleaner
  - 6) Washing machine
  - 7) Clothes dryer
  - 8) Air conditioner
33. Education including school fees, private tuition fees, books and supplies, assessment papers, study guides (c033)

- 34. Life insurance (term policies only, excluding premiums for plans with a saving component) (c034)  
Other insurance such as travel insurance or maid insurance (c035)
- 35. Contributions to religious or charitable organizations (c036)
- 36. Cash gifts to families or friends (c111)
- 37. Any other spending (c038)

We define total household consumption spending as the sum of items No. 1–35, and 38. We define durables spending as the sum of No. 7, 8, 30, and 32, and nondurables spending as the rest of total household consumption spending. Total household consumption spending measure does not include giving behavior (cash gifts to families, relatives, and friends, and donations to charity or religious organizations).

#### Labor Market Outcomes

- 1. Employment is defined 1 if a respondent is working for pay at the time of the survey participation, 0 otherwise.
- 2. Self-employment is defined 1 if a respondent is self-employed at the time of the survey participation, 0 otherwise.
- 3. Full-time work status is defined 1 if a respondent works 35 hours or more per week and 0 otherwise, conditional on employment or self-employment. It is noteworthy that the SLP does not collect information on a continuous measure of work hours. Instead, it asks if a respondent works 35 hours or more per week, less than 35 hours per week, or it varies (sometimes less, sometimes more than 35 hours per week). We consider those who work 35 hours or more as full-time workers.
- 4. Labor income, measured conditional on working, is the response to the following question: “how much was your total income from work in the month of [last month], before taxes and other deductions? If you had more than one job then please report the total from all jobs. [not spouse income from work]”

#### Other variables

- 1. Chronic health conditions  
We use information on whether a respondent has any chronic health condition or not, including cancer, diabetes, stroke, heart problems, hypertension, arthritis, psychiatric problems. The SLP asks its respondents each month whether he or she is told by a doctor to have each of these conditions.
- 2. Household net worth is total household assets net of total household debts.
- 3. Health literacy score is adapted from the existing scale used in the public health literature (Chew et al. 2004). the sum of the following (re-coded) raw questions asked in Wave 9 (April 2016):
  - 1. How confident are you filling out medical forms by yourself? (s00410)
  - 2. How often do you have problems learning about your medical condition because you find it difficult to understand the information provided? (s00420)
  - 3. How often do you have someone (like a family member, hospital/clinic worker, or caregiver) help you read hospital (or other medical) material? (s00430)

4. Total household income is the sum of own labor income, spouse's labor income (if married), income from families, relatives, and friends, and any other income (welfare benefits, rental income, pension benefits, etc.)

#### Appendix Reference

Chew, L.D., Bradley, K.A. and Boyko, E.J., 2004. Brief questions to identify patients with inadequate health literacy. *health*, 11, p.12.