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# Impacts of the COVID-19 crisis on single-person households in South Korea

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## ABSTRACT

Using nationally representative income and expenditure data from South Korea, we show that single-person households suffered a much greater decrease in household income and expenditure compared to multi-persons households during the COVID-19 pandemic in 2020. Negative effects on income were largest for the single-person households in ages 50–64, mostly driven by decreases in earned income rather than business income. There was no corresponding decrease in consumption expenditures, however, other than on transportation expenditure for young men. Notably, there were significant decreases in non-consumption expenditures that are related to formal and informal consumption-smoothing mechanisms, such as spending on insurances, pensions, and household transfers. Our findings highlight the disproportionately negative effects of the COVID-19 pandemic on the middle-aged single-person households. With reduced spending on consumption-smoothing mechanisms, this group is likely to be even more vulnerable to negative income shocks in the future.

## 1. Introduction

Since South Korea experienced its first COVID-19 case on January 20th, 2020, authorities implemented relatively swift and successful measures to curb the spread of the disease (Oh et al., 2020). The effects of the pandemic on the economy persisted (Aum, Lee, & Shin, 2021), however, providing lessons to other countries working towards ending the pandemic and economic recovery.

In this study, we investigate the effects of the COVID-19 pandemic on household income and expenditure in South Korea, with a focus on the experience of single-person households. The number of single-person households rose rapidly around the world for all ages and gender, representing more than one-third of all households in many developed countries (Snell, 2017; Yeung & Cheung, 2015). However, they were rarely studied in economics even though the literature suggests that working-age single-person households are likely to be highly vulnerable to economic shocks (Yeung & Cheung, 2015).

Using a nationally representative survey of income and expenditure in South Korea, we find that, during the COVID-19 pandemic, (1) household income and expenditure decreased, but not for the expenditure on necessities; (2) non-consumption expenditure related to formal and informal consumption-smoothing mechanisms declined significantly; and (3) the negative effects were greater for single-person households, especially for those between ages 50 and 64.

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Our contributions to the literature are as follows. First, we estimate the effects of the COVID-19 pandemic on both income and expenditure using nationally representative data in South Korea that includes cash transactions and household transfers. Previous studies on the effects of the pandemic on expenditure or consumption often used credit-card transaction data which do not include cash transactions and transfers. We also add evidence from South Korea, extending previous studies which focused on the spending behaviors of Seoul residents only (Jo, Shin, & Kim, 2020; Shin, Kim, & Koh, 2021).

Second, we show that households reduced expenditures on consumption smoothing mechanisms including insurance, pension, and household transfers during the COVID-19 pandemic, making them more vulnerable to future negative income shocks. Literature did not investigate the effects of the pandemic on non-consumption expenditures with few exceptions (Kim, Koh, & Zhang, 2022). Focusing only on the immediate effects on income and consumption may understate the true damage of the pandemic.

Third, we show that single-person households were more negatively affected by the COVID-19 pandemic than multi-persons households. Previous studies identified women and low-skilled workers as vulnerable groups (Adams-Prassl, Boneva, Golin, & Rauh, 2020; Dang & Nguyen, 2021) but did not focus on the effects on single-person households. Given that single-person households have more limited access to within-household insurance mechanisms (Kotlikoff & Spivak, 1981; Piyapromdee & Spittal, 2020), negative effects on their income and consumption-smoothing mechanisms imply they are likely to be even more vulnerable to future negative income shocks compared to other types of households.

The rest of this study proceeds as follows. Section 2 discusses previous studies on the effects of the COVID-19 pandemic. Section 3 explains the background information on the single-person households in Korea. Section 4 describes the data set used in the study and Section 5 discusses the empirical model, the Difference-in-Differences method. Section 6 presents empirical results with further discussions in Section 7. Section 8 concludes.

## 2. Literature review

A large body of literature documented negative effects of the COVID-19 pandemic on employment, implying reduced household earnings (Adams-Prassl, Boneva, Golin, & Rauh, 2020; Aum, Lee, & Shin, 2021; Belot et al., 2021; Dang & Nguyen, 2021; Chetty, Friedman, Hendren, & Stepner, 2020). A common finding across these studies is that the negative effects were greater for low-skilled workers, women, and households at lower quantiles in income distribution before the pandemic.

Other studies investigated the effects of the COVID-19 on consumption, using bank or credit-card transaction data (Campos-Vazquez & Esquivel, 2021; Sheridan, Andersen, Hansen, & Johannesen, 2020; Chetty, Friedman, Hendren, & Stepner, 2020). A common finding across these studies is that consumption of travel, leisure, and services declined in response to the severity of the pandemic. However, they did not examine cash purchases or transfers due to the data limitations of bank or credit card transaction data. Some studies found that cash savings increased, mainly because households could not spend at the before-pandemic level during lockdown (Bounie et al., 2020; Cox et al., 2020; Dossche & Zlatanov, 2020).

A recent study by Kim et al. (2022) investigated the effects of the COVID-19 pandemic lockdown on consumption spending, savings, and private transfers in Singapore. The authors found negative impacts on consumption spending and private transfers received but also positive impacts on savings, perhaps because of precautionary savings motive. They also found that targeted cash transfers to low-income households helped mitigate the effects of the pandemic on consumption. Their findings on consumption spending and private transfers are broadly consistent with the findings in our study. Our study differs from theirs by not focusing specifically on lockdown and by focusing on single-person households.

Recent literature showed that risk-pooling is an important feature of married households, implying that single-person households may be more vulnerable to negative economic shocks (Ortigueira & Slassi, 2013; Wang, 2019). However, the effects of the COVID-19 pandemic on single-person households received little attention. An exception is Piyapromdee and Spittal (2020), who showed that singles in the UK were more heavily affected by the current pandemic than the couples.

## 3. Background

Single-person household is the fastest-growing type of household in Asia, Europe, North, America, and many other parts of the world (Snell, 2017; Yeung & Cheung, 2015). According to Statistics Korea, the proportion of single-person households among all Korean households increased from 15.5% in 2000 to 30.2% in 2019.

This increase in the proportion of single-person households in Korea and elsewhere is driven by young and middle-aged individuals (Yeung & Cheung, 2015). Many of the young single-person households in Korea work in temporary low-wage jobs, delaying marriages and living alone because they feel financially unprepared to commit to marriage or relationship. However, they may increase earnings with more work experience and receive financial support from parents and other family members in times of crisis (H. Kim, 2014).

Middle-aged single-person households in Korea are divorced or separated individuals who have been experiencing economic difficulties before living alone. They typically started job experience before the Asian financial crisis of 1998, during which time income steadily increased and layoffs were uncommon. Economic upheaval and labor market reforms following the financial crisis unexpectedly removed many of the job securities these workers have enjoyed. The divorce rate increased, and the proportion of those who cited financial problems as a reason for the divorce increased as well (A. Kim, 2004). Others remain married but choose to live apart from their spouses and children because of job requirements or to support children's attendance in prestigious schools located far from home (Koo & Lee, 2006), putting further pressure on household budget.

Single-person households are unable to pool risks with other household members, leaving them more vulnerable to negative economic shocks compared to multi-persons households. For example, Alm, Nelson, and Nieuwenhuis (2020) showed that poverty

among working-age single-person households in Sweden has increased from 1988 to 2011 because they could not rely on informal insurance of the family just as government welfare was substantially reduced. This problem may be particularly serious for middle-aged single person households in Korea who live alone because of economic insecurity such as unemployment (A. Kim, 2004). Unemployment further reduces their informal social networks which are typically built around jobs.

#### 4. Data

This study utilizes a data set called the Household Income and Expenditure Survey (HIES) in South Korea. The HIES is a nationally representative survey of about 7200 households, collected and published quarterly, that measures household income and expenditure for the month of the survey. The HIES includes demographic characteristics and occupational characteristics of the household members and the household-level income and expenditure. In 2018, the survey was divided into two sections. One was a quarterly survey on household income, and the other was an annual survey on household expenditures, which led to two different data sets for income and expenditure. In 2019 and 2020, income and expenditure were surveyed quarterly as one data set. We account for this irregular data structure in our empirical analysis.

Our sample covers up to the third quarter of 2020. As seen in Fig. 1, the first COVID-19 case was confirmed on January 23, and rapid increases in the number of cases were observed by late February. Social distancing measures were announced by the end of March that led to restrictions on public gathering and temporary closure of businesses that could facilitate the spread of the virus. The daily number of cases stabilized by the second quarter so that social distancing mandate was relaxed in early May, lifting many of the earlier restrictions on public gathering. Government also tried to lessen the economic impact of the pandemic by allowing many of the businesses to operate and initiating cash transfers to households. However, by the middle of the third quarter, a rapid increase in the number of cases following public protest in August led to even more restrictive social distancing measures.

The data set contains three income variables: current income, earned income, and business income. Current income refers to income generated from all economic activities, such as earned income received by households and their members, business income, interest, dividends, and income transferred from the government or other households. Earned income refers to the total labor income before deducting expenses, such as tax and utility charges, including salary income and bonuses, for household heads and other household members. Business income refers to income transferred to households from sales revenues earned through business management, including rental income such as housing. On average, multi-persons households and single-person households aged 49 or less tend to earn more than single-person households in older age categories. Single-person households aged 65 or above earn the least in all income variables considered (see Table 1).

In addition, the data set contains total expenditure, total consumption, and 12 consumption item variables. Total expenditure consists of consumption and non-consumption expenditure. Total consumption expenditure refers to expenses spent for the purchase of goods and services for everyday household needs. Non-consumption expenditure refers to expenses spent on taxes, public pensions, social insurance, and household transfers. 12 consumption expenditure categories include: grocery & non-alcohol drink, liquor & tobacco, clothes & shoes, housing, water, light & heat, household goods & household services, health, transportation, communication, entertainment & culture, education, food & accommodation, and other goods & services. The pattern of expenditure mostly reflects the pattern of earned income, whereby multi-persons households and young single-person households spend more than single-person households in older age groups (see Table 2).

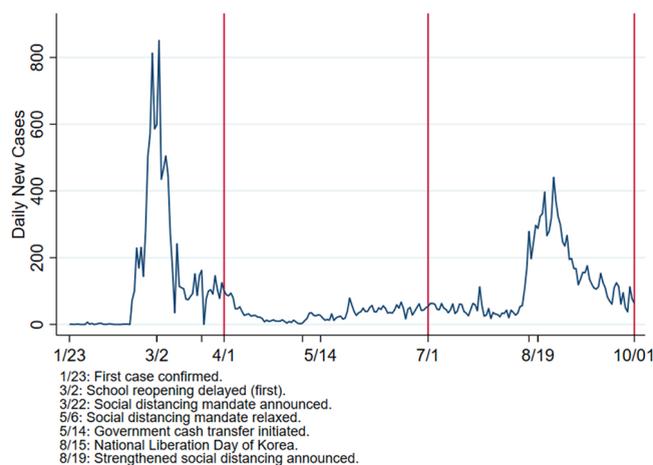
“Non-consumption expenditure” variables in the data set include insurance, pension, and household transfers (Table 2). Insurance expenditure includes the purchase of insurance services such as life insurance and insurance against hazards, diseases, or fire.<sup>1</sup> Multi-persons households and single-person households aged 50–64 spend more on insurance than single-person households aged 49 or less or 65 or above. Pension expenditure includes expenditure on public pension plans, including the National Pension Service and other programs for public sector workers. Expenditure on this is understandably largest among those 49 or below, followed by multi-persons households and single-person households aged 50–64.

Household transfer consists of customary cash gifts at weddings and funerals, a common practice in Korea (T. Y. Lee, 2020). These gifts are often motivated by the desire to maintain social network and fulfill the cultural expectation and range at least from 50,000 KRW to many times more per gift (Cnaan, Kang, Kim, & Lee, 2014; Byun, 2020, S.-Y. Park, 1998).<sup>2</sup> Transfers made to children, elderly parents, and relatives are also included in the household transfer. Single-person households tend to spend more on household transfers than multi-persons households, which may indicate a greater need to maintain private social networks through transfers. Among them, those aged 50–64 spent the most in this category, likely because more of middle-aged individuals would have elderly parents who need support. They would also have more social requirements such as weddings (of peers’ children) and funerals (of peers’ parents). Park (2014) showed that the transfers children made to their parents were not motivated by the expectation of parents’ inheritance or other financial returns. Instead, they were motivated by altruism, in lieu of personal visits, or to compensate for childcare services parents provided.

Table 1 and Table 2 show that household demographic characteristics are similar between income and consumption samples. About 70% of household heads are men. This proportion is smaller among single-person households and is decreasing with age. Young single-

<sup>1</sup> While the purchase of insurance services is included in the category of “Consumption of other goods and services” in the raw data, we decided to categorize it along with other non-consumption expenditures to emphasize its role as a consumption-smoothing mechanism.

<sup>2</sup> Park (1998) surveyed 280 Seoul residents and found that as much as 40% of the gift-giving is motivated by reasons other than altruism, such as cultural obligation and self-interest.



**Fig. 1.** Daily New COVID-19 Cases in South Korea in 2020.

Source: Korean Disease Control and Prevention Agency.

**Table 1**

Descriptive Statistics of Income Variables.

	All households		Multi-persons HH		Single-person HH					
					Age 49 or less		Age 50–64		Age 65 or over	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Current income	248.845	191.118	271.696	186.222	269.168	192.824	225.553	249.718	111.433	83.157
Earned income	148.889	181.713	164.941	181.030	207.055	196.468	130.028	206.590	19.601	49.349
Business income	50.791	121.663	59.449	128.860	37.584	120.629	45.310	120.563	12.868	48.061
Male	0.697	0.459	0.815	0.389	0.606	0.489	0.448	0.497	0.234	0.423
Less than high school diploma	0.297	0.457	0.237	0.425	0.022	0.146	0.375	0.484	0.825	0.380
high school diploma	0.309	0.462	0.336	0.472	0.264	0.441	0.399	0.490	0.121	0.327
More than high school diploma	0.394	0.489	0.428	0.495	0.714	0.452	0.225	0.418	0.054	0.225
Currently married	0.628	0.483	0.851	0.356	0.063	0.244	0.163	0.370	0.048	0.214
Sample size	59,641		42,299		5528		4771		7043	

Notes: Unit of income is in 10,000 KRW (about 9 US dollars). Current income: income generated from all economic activities and income transferred from the government or other households. Earned income: total labor income before deducting expenses. Business income: income transferred to the households from sales revenues earned through business management, including rental income. Male, education level categories, and current marital status are binary indicators. HH: household. Income variables are in per capita values.

person households are the most educated, where more than 70% had some education beyond high school. Only about 42% of multi-persons households had education beyond high school, followed by middle-aged and older single-person households. Over 16% of the single-person households aged 50–64 are currently married, while only about 5% are currently married in other age groups. This is consistent with the reports of some parents choosing to live apart for occupation or children's education (A. Kim, 2004, Koo & Lee, 2006). In comparison, 85% of multi-persons household heads are married.

The income and expenditure variables are converted to per capita values by dividing the variables by the square root of the number of household members (Aaberge & Melby, 1998; Brandolini & Smeeding, 2011). Per capita values are used for descriptive statistics and empirical analysis.

In our sample, age groups are divided into those under 50 (“the young”), between 50 and 64 (“middle-aged”), and those 65 or above (“the elderly”). We separately focus on the middle-aged group in ages between 50 and 64 in part because it has received attention among scholars and policymakers as a heightened period of economic instability. Recent government reports highlight those above 50 but still within working age (under 65) as facing significant difficulties in labor market participation because of hierarchical corporate culture and age discrimination, for example (Hwang et al., 2019, J. Kim, 2022). Government also initiated job training and search programs for job seekers above age 50 and vouchers to employers who hire those above 50 (Korea Policy Briefing, 2021). Fig. 2 shows that income starts to decline from early 50 s, although consumption seems smoothed out, for the single person households.

## 5. Empirical strategy

### 5.1. Identification

We implement the difference-in-differences (DID) method by defining the treatment and comparison groups over the same calendar

**Table 2**  
Descriptive Statistics of Expenditure Variables.

	All households		Multi-persons HH		Single-person HH					
					Age 49 or less		Age 50–64		Age 65 or over	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total expenditure	202.724	161.847	216.048	154.413	217.630	184.345	204.049	221.743	104.011	82.624
Total consumption	150.800	122.499	160.572	119.718	163.507	151.622	140.425	135.752	84.833	67.380
Consumption Expenditure										
Grocery & Non-alcohol drink	23.024	13.843	24.972	13.391	13.391	9.314	20.423	14.258	21.140	15.491
Liquor & Tobacco	2.463	4.172	2.298	3.636	4.020	5.784	3.821	5.988	1.155	3.347
Clothes & Shoes	7.707	11.344	8.429	11.230	9.395	14.897	6.319	10.871	2.599	5.974
Housing	18.813	27.523	16.796	25.436	29.478	26.018	24.664	39.707	17.918	28.263
Household goods & Services	7.456	20.962	8.145	20.882	6.319	28.031	5.950	17.058	5.172	15.639
Health	13.924	26.860	14.828	26.518	7.803	19.401	13.408	33.586	14.040	28.637
Transportation	18.829	77.232	20.582	76.813	22.154	98.796	18.307	94.727	5.110	25.214
Communication	7.295	8.200	8.131	8.337	8.006	9.581	6.077	7.111	2.217	3.299
Entertainment & Culture	9.864	20.887	10.698	20.203	13.714	33.064	7.115	14.768	3.079	10.563
Education	8.573	22.540	11.161	24.303	4.348	21.031	2.520	18.108	0.229	4.109
Food & Accommodation	20.158	17.622	20.714	16.404	32.320	21.148	19.137	19.013	6.474	9.625
Other goods & Services	12.695	22.044	13.819	22.348	12.559	24.179	12.685	21.432	5.701	16.551
Non-Consumption Expenditure										
Insurance Expenditure	5.044	5.785	5.818	5.713	3.401	5.538	5.540	7.150	1.258	2.832
Pension Expenditure	6.814	10.150	7.740	10.213	8.708	9.225	5.723	13.461	0.029	0.481
Household Transfer	16.964	40.744	15.901	28.625	19.943	54.301	30.930	93.361	11.162	25.728
Male	0.707	0.455	0.823	0.382	0.603	0.489	0.467	0.499	0.242	0.428
Less than high school diploma	0.291	0.454	0.236	0.424	0.023	0.149	0.367	0.482	0.825	0.380
high school diploma	0.306	0.461	0.332	0.471	0.255	0.436	0.404	0.491	0.121	0.326
More than high school diploma	0.403	0.491	0.433	0.495	0.722	0.448	0.229	0.420	0.054	0.226
Currently married	0.633	0.482	0.857	0.350	0.063	0.242	0.170	0.376	0.053	0.224
Sample size	65,827		46,668		6590		5205		7364	

Notes: Expenditures and consumptions are in 10,000 KRW (about 9 US dollars). Total expenditure: total consumption and non-consumption expenditure. Total consumption: expenses spent for the purchase of goods and services for everyday household needs. Non-consumption expenditure: expenses spent on taxes, public pensions, social insurance, and household transfers. Male, education level categories, and current marital status are binary indicators. Housing: Housing, Water, Light & Heat. Expenditure variables are in per capita values.

period. We use quarterly income data from the third quarter of 2018 to the third quarter of 2020. We also use quarterly expenditure data up to the third quarter of 2020, but 2018 data is available only as an annual average.

Our DID model is based on comparing the change from 2019 to 2020 (the “treatment group”) to the change from 2018 to 2019 (the “control group”), so that observations in 2019 appear in both the treatment group and the control group. Consider the data-generating process

$$Y_{iqt} = \pi_0 + \pi_q + \pi_\tau t + \pi_{Cq} + \nu_{iqt}, \quad q \in \{1, 2, 3, 4\}. \tag{1}$$

$Y_{iqt}$  is the outcome variable of interest for individual  $i$ , quarter  $q$ , and year  $t$ .  $\pi_{Cq}$  is the shock due to the COVID-19 pandemic in year 2020 and quarter  $q$ .  $\pi_{Cq}$  equals 0 in years before 2020.  $\nu_{iqt}$  is mean-zero idiosyncratic error term.  $\pi_q$  captures seasonal effects and  $\pi_\tau$  captures yearly trends. The goal is to identify  $\pi_{Cq}$  for  $q = 1, 2, 3$ , the first three quarters of 2020.

$\pi_{Cq}$  can be identified by

$$\Delta Y_{q,post} - \Delta Y_{q,pre} = \pi_{Cq}. \tag{2}$$

For income equation, let

$$\Delta Y_{q,pre} \equiv E[Y_{iqt}|q, t = 2019] - E[Y_{iqt}|q, t = 2018] = \pi_\tau, \tag{3}$$

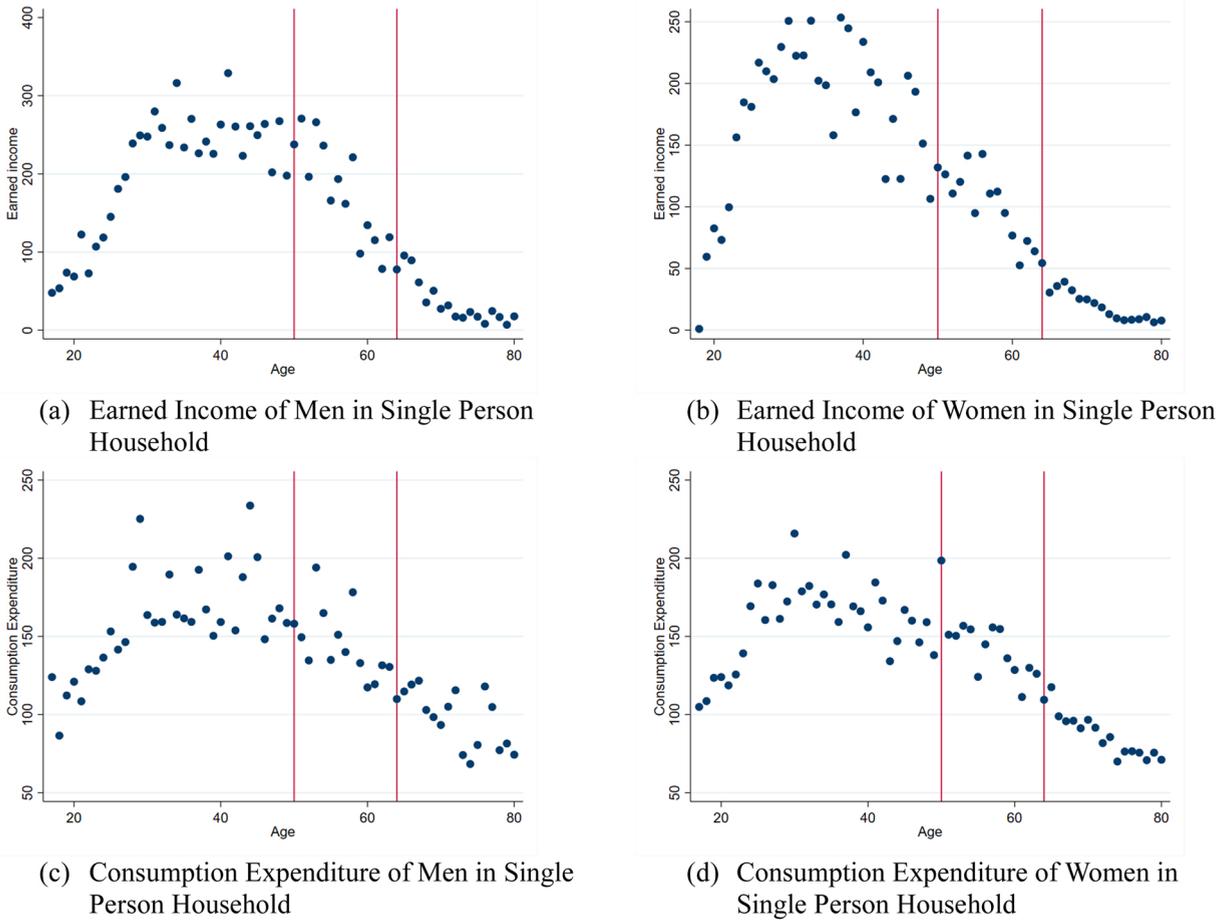
$$\Delta Y_{q,post} \equiv E[Y_{iqt}|q, t = 2020] - E[Y_{iqt}|q, t = 2019] = \pi_\tau + \pi_{Cq}. \tag{4}$$

$\pi_{Cq}$  is identified by subtracting Eq. (3) from Eq. (4). The “treatment” group consists of observations in 2019 and 2020, and the “control” group consists of observations in 2018 and 2019. Parallel trend assumption is equivalent to assuming that the values of  $\pi_q$  and  $\pi_\tau$  do not change over time for all  $q$  and  $t$ . Note that under the assumption that seasonality effects are the same in each year, we can account for yearly trend using  $\Delta Y_{q,pre}$  for any  $q$ .

For expenditure variables, only annual average is available for the year 2018. We therefore take a slightly different approach to identify  $\pi_{Cq}$  by defining

$$\Delta Y_{q,pre} \equiv E[Y_{iqt}|q, t = 2019] - E[Y_{iqt}|t = 2018] = \pi_\tau + \pi_q - E[\pi_q|t = 2018], \tag{5}$$

$$\Delta Y_{q,post} \equiv E[Y_{iqt}|q, t = 2020] - E[Y_{iqt}|t = 2019] = \pi_\tau + \pi_q - E[\pi_q|t = 2019] + \pi_{Cq}. \tag{6}$$



**Fig. 2.** Age Profile of Income and Consumption Expenditure of Single Person Households. Notes: Vertical lines indicate ages 50 and 65. Current income: income generated from all economic activities and income transferred from the government or other households. Earned income: total labor income before deducting expenses.

Subtracting Eq. (5) from Eq. (6) identifies  $\pi_{Cq}$  under the assumption that the annual averages of seasonality effects are the same in 2018 and in 2019. This would be true if the values of  $\pi_q$  do not change over time for all  $q$ , implied by the parallel trend assumption imposed to identify  $\pi_{Cq}$  for the income equation.

In Table A1 through Table A6 in the appendix, we present sample means that correspond to the conditional expectations in Eqs. (3), (4), (5), and (6), and the estimates of  $\pi_{Cq}$  based on these. We do not find unusual outliers among the sample means, suggesting that the results are unlikely to be driven by outliers within the sample period. The estimates of  $\pi_{Cq}$  are comparable to the estimated values (in Section 6) based on the empirical models in the next section.

5.2. Empirical model

Our empirical model estimates  $\pi_{Cq}$ , the effect of COVID-19 pandemic on the outcome of interest in quarter  $q$ , in a single regression equation. For income equation, we estimate the DID regression of the form:

$$Y_{it} = \alpha + \beta COVID19_{it} + \gamma_4 Q4_{it} + \gamma_1 Q1_{it} + \gamma_2 Q2_{it} + \gamma_3 Q3_{it} + \delta_4 COVID19_{it} \times Q4_{it} + \delta_1 COVID19_{it} \times Q1_{it} + \delta_2 COVID19_{it} \times Q2_{it} + \delta_3 COVID19_{it} \times Q3_{it} + \beta_X X_{it} + U_{it}. \tag{7}$$

$Y_{it}$  is monthly income in 10,000 KRW for individual  $i$  at time  $t$ , which is approximately 9 US dollars.  $COVID19_{it}$  is an indicator that equals 1 for the time from the third quarter of 2019 to the third quarter of 2020. In this regression, the effect of the pandemic on monthly income in quarter  $q$  is shown by

$$\pi_{Cq} = \Delta Y_{q,post} - \Delta Y_{q,pre} = \gamma_q + \delta_q - \gamma_q = \delta_q, \quad q = 1, 2, 3. \tag{8}$$

For expenditure equation, we estimate DID regression of the form:

$$Y_{it} = \alpha + \beta COVID19_{it} + \gamma_1 Q1_{it} + \gamma_2 Q2_{it} + \gamma_3 Q3_{it} + \delta_1 COVID19_{it} \times Q1_{it} + \delta_2 COVID19_{it} \times Q2_{it} + \delta_3 COVID19_{it} \times Q3_{it} + \beta_X X_{it} + U_{it}. \quad (9)$$

$Y_{it}$  is the monthly expenditure in 10,000 KRW for individual  $i$  at time  $t$ . Similar to Eq. (8), we have

$$\pi_{Cq} = \Delta Y_{q,post} - \Delta Y_{q,pre} = \gamma_q + \delta_q - \gamma_q = \delta_q, \quad q = 1, 2, 3. \quad (10)$$

Table A7 and Table A8 in the appendix lay out in further detail how the empirical model corresponds to the population model in Eq. (1) and identifies  $\pi_{Cq}$ .

We estimate Eqs. (7) and (9) for each age group, and for each age-by-gender group, of single-person households. We focus on gender heterogeneity for several reasons. First, women are less likely to be employed in managerial positions and more likely to be employed in service sectors, exposing them to different sector-specific shocks and making it relatively more difficult for them to maintain social distancing (Aum et al., 2021; Sandefur and Park, 2007). Second, women's labor force participation and employment rate significantly differ by marital status and age. They may have greater difficulty finding and maintaining jobs than those in other demographic groups during economic downturns (Han & Lee, 2020; Han and Lee 2020, Lee, Jang, & Sarkar 2008). Finally, women may face discrimination based on gender, marital status, or age (Kim & Oh, 2022).

## 6. Empirical results

### 6.1. Results on income

We present the estimates in figures, with corresponding full regression results in the appendix (Table A10 to Table A25). Fig. 3 presents the effects of the COVID-19 pandemic on the income of all households and on the income of single-person households by age categories, based on the estimates of  $\delta_1$ ,  $\delta_2$ , and  $\delta_3$  in Eq. (7). The first bar for each subgroup represents the tests of parallel trend assumption, based on the estimates of  $\delta_4$ , which is necessary for the identification of the difference in differences model. We find that the assumption is not rejected overall, as the differences in income changes over time before the pandemic are insignificant for all estimates except for the earned income of the young single-person households.

Panel A of Fig. 3 shows dramatic decreases in current monthly income among middle-aged single-person households, reaching 800,000 KRW (approximately 670 USD) in the second quarter of 2020. This is approximately 30% of average monthly current income of this group in the second quarter of 2019 (see Table A2). These effects are driven by decreases in earned income rather than business income, as shown in Panels B and C.

Fig. 4 focuses on gender differences among single-person households. The effects are negative on the earned income of middle-aged men and women, men experiencing worse effects than women. These effects are mostly driven by negative effects on earned income. Negative effects on business income are mostly insignificant.

Interestingly, the pandemic has positive effects on the earned income of single-person households under 50.<sup>3</sup> Why does the earned income increase for the young group? We find suggestive evidence that unusual growth in the consumption of online delivery services in Korea led to large increases in the employment of unskilled young men. First, delivery industries in Korea benefited from the COVID-19 pandemic to a much greater extent compared to other countries. The online food sales in Korea grew by 46% during the initial phase of the pandemic (Cho, 2021). Although other countries also showed large increases in online food sales, according to the report by McKinsey & Company, South Korea is the only country among large economies around the world where consumers expected major increases in expenditures in food and grocery delivery in the near future during the pandemic (Arora et al., 2020). Second, expansion of these industries led to an increase in local labor demand, which was disproportionately met by young unskilled men who were more likely to live alone (Kim, Koh, & Bang, 2020).

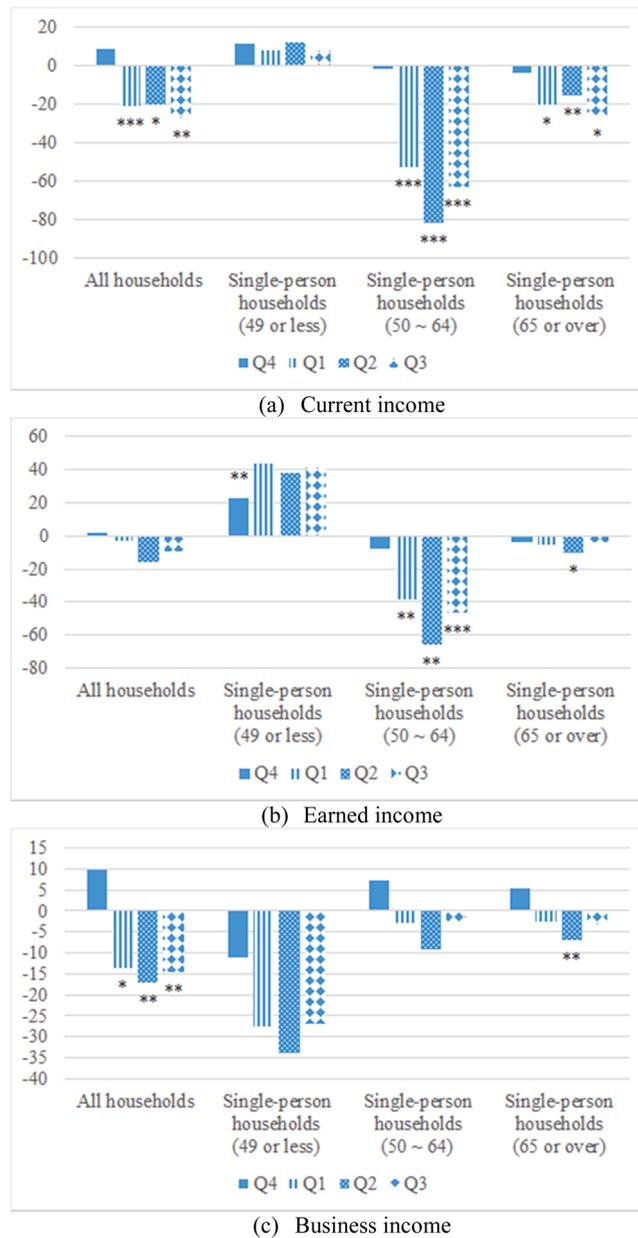
As another suggestive evidence, we estimate Eq. (7) on the subsample consisting of those working in food, logistics and restaurant-related industries.<sup>4</sup> Table A9 in the appendix shows that the positive impacts on earned income among the young are concentrated on those working in restaurant-related industries. The positive impact is smaller and magnitude and insignificant in the subsample that exclude these industries even though this subsample has more observations.

### 6.2. Results on total expenditure and consumption expenditure

Examining the pandemic effects on expenditures, Fig. 5 shows that young and middle-aged single person households experienced worse effects of the pandemic on total expenditure compared to other households. These reductions in total expenditures are 12–17% of the total expenditures of the same quarter in 2019 for the young group and 16–20% for the middle-aged group (see Table A4 and Table A5). For the first quarter of 2020, negative effects on consumption expenditure can explain a large part of these effects. However, for the second and the third quarter, and especially for middle-aged single person households, consumption expenditure decreases do not explain the negative effects on total expenditures. Fig. 6 further shows that the negative effects among the middle-aged single person households are concentrated among men, and that consumption expenditure decreases do not explain the negative effects on

<sup>3</sup> Although the positive effects are not significant overall when tested using wild cluster bootstrap p-values, they are significantly different from zero when classical robust standard errors are used. See Table A10 to Table A25.

<sup>4</sup> This is based on the category provided by the data set.

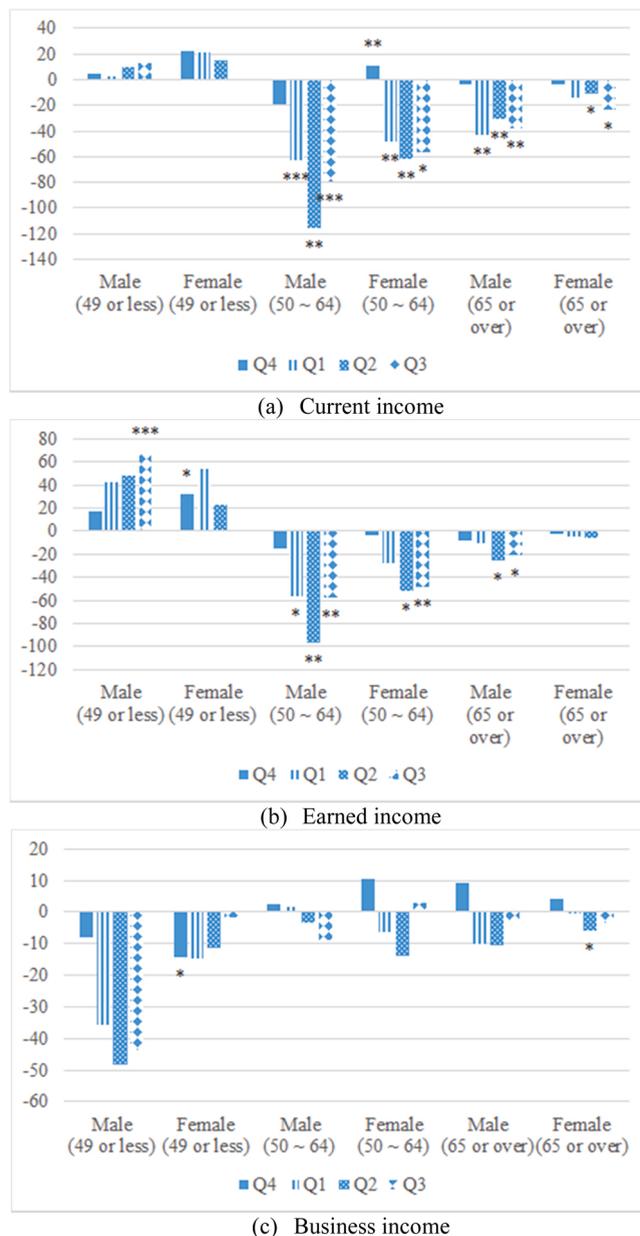


**Fig. 3.** Income Analysis by Household Type and Age. Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . P-values are based on wild cluster bootstrap (Cameron and Miller, 2015) with 10,000 replications based on 7 industry clusters. Q4: 4th quarter of 2019. Q1: 1st quarter of 2020. Q2: 2nd quarter of 2020. Q3: 3rd quarter of 2020. Unit is in 10,000 KRW, about 9 USD. Current income: income generated from all economic activities and income transferred from the government or other households. Earned income: total labor income before deducting expenses. Business income: income transferred to the households from sales revenues earned through business management, including rental income.

total expenditure. In contrast to the experience of the young and middle-aged households, the expenditures by the elderly are not significantly affected by the pandemic.

Figure A1 and Figure A2 in the appendix show the effects of the pandemic on each category of the consumption expenditure. Positive effects on groceries expenditures possibly reflect the consequences of social distancing and working from home which encouraged people to reduce going out and cook more at home. Greater effects among the elderly are consistent with the implications of consumption smoothing (Aguilar, Hurst, & Karabarbounis, 2012). Negative effects on transportation by young male who tend to be more active than others are consistent with international evidence (Sheridan et al., 2020).

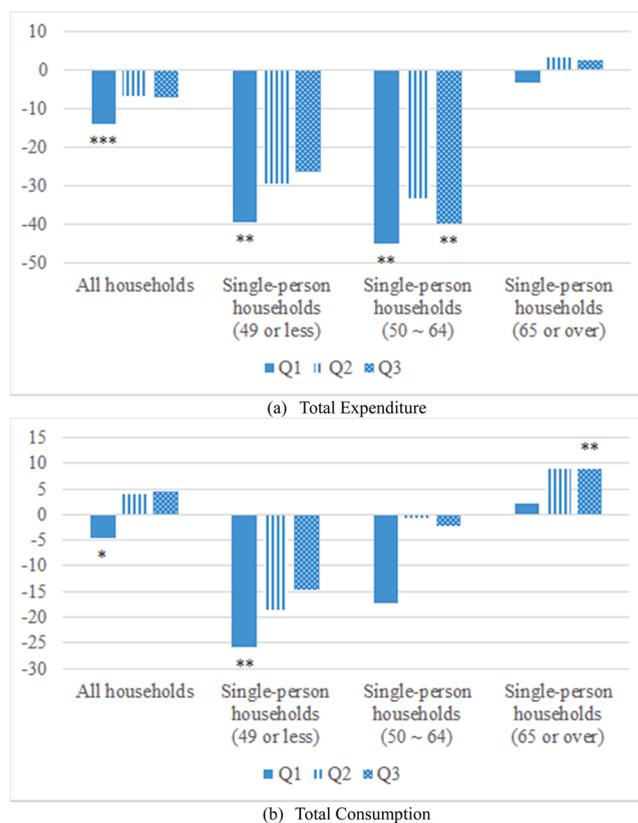
Interestingly, spending decreased only slightly in entertainment and culture category and food and accommodation category compared to those in other countries (Sheridan et al., 2020). We believe there are several reasons for this. First, relatively relaxed social distancing restrictions in Korea allowed deliveries to be made (Kim, Ko, Kim, & Jung, 2020). Considerably relaxed social distancing



**Fig. 4.** Income Analysis by Gender and Age among Single-Person Households. Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . P-values are based on wild cluster bootstrap (Cameron and Miller, 2015) with 10,000 replications based on 7 industry clusters. Q4: 4th quarter of 2019. Q1: 1st quarter of 2020. Q2: 2nd quarter of 2020. Q3: 3rd quarter of 2020. Unit is in 10,000 KRW, about 9 USD. Current income: income generated from all economic activities and income transferred from the government or other households. Earned income: total labor income before deducting expenses. Business income: income transferred to the households from sales revenues earned through business management, including rental income.

restrictions in the second quarter and part of the third quarter likely have contributed to more spending on restaurants. In fact, about a quarter of the disaster relief funds from the government in the second quarter of 2020 was spent on groceries, and another quarter spent on restaurants (Cho, 2021).

Second, there has been a large increase in the consumption of home streaming services since the beginning of the pandemic compared to other countries. A survey by Korea Communications Commission show that the use of home streaming services increased from 52% in 2019 to 66.3% in 2020, a 14.3% point increase (Korea Communications Commission, 2020). This is larger than increases in other countries such as the US where the use of streaming services increased by 4–7% points comparing before and after the beginning of the pandemic (Gray, 2020). One potential reason for such large increases may be the high rate of household broadband access in South Korea (Ramirez, 2017) which may have allowed demand for films to easily switch to streaming services. Further, South Korea has one of the largest film markets in the world, ranking third in the world outside the US in terms of box office sales (Motion



**Fig. 5.** Expenditure Analysis by Household Type and Age. Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . P-values are based on wild cluster bootstrap (Cameron and Miller, 2015) with 10,000 replications based on 7 industry clusters. Q1: 1st quarter of 2020. Q2: 2nd quarter of 2020. Q3: 3rd quarter of 2020. Unit is in 10,000 KRW, about 9 USD. Total expenditure: total consumption and non-consumption expenditure. Total consumption: expenses spent for the purchase of goods and services for everyday household needs.

Picture, 2019).

### 6.3. Results on non-consumption expenditure

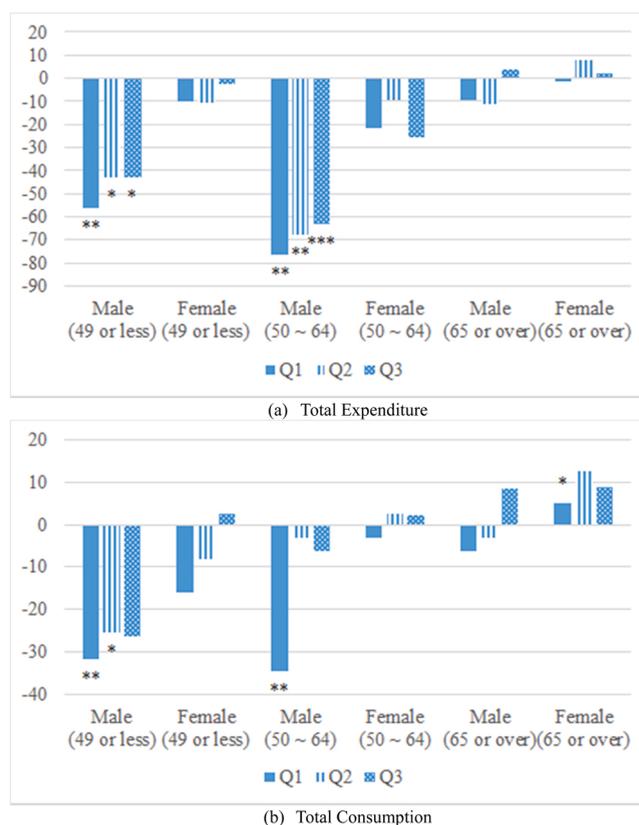
The previous section showed that the reductions in consumption expenditures only partially explain the negative effects of the pandemic on total expenditures. Further, “essential” consumption such as food and housing were not seriously impacted by the pandemic.

Therefore, we turn to examine expenditure categories that are not related to immediate consumption including spending on insurance, pension, and household transfers. Reductions in spending on insurance and pension indicate the erosion of formal consumption smoothing mechanisms. Reduction in household transfers would weaken social ties, making it more difficult to give or receive assistance. It could be, therefore, interpreted as the erosion of informal consumption smoothing mechanisms.

Fig. 7 and Fig. 8 present the effects of the pandemic on non-consumption expenditures. The reduction in insurance expenditure is significant across all age groups, genders, and time periods. The largest reduction is observed for males in 50–64 age group, in which the reductions are approximately 22–37% of the average insurance expenditures in the same quarter in the previous year. The sizable reduction is remarkable because individuals in this age group would be strongly motivated to prepare for retirement. This effect is almost twice as large as the effect for the overall sample and for women in the same age group, and almost three times as large as that for men 49 or below.

Pension expenditures also decreased, but at smaller magnitudes and concentrated on the 50–64 age group. The magnitude of reduction for the middle-aged is up to 42% of the pension expenditures in the previous year. Fig. 8 shows that this result is driven mostly by middle-aged women. Middle-aged men also experienced decreases, but the estimates are borderline significant. Pension spending by older single-person households was not affected as they would be on the receiving end of pension plans.

Why was the reduction in pension expenditure mainly driven by women? First, Korean women’s pension contributions are more tightly linked to employment than for Korean men, and very few women make pensions contributions if they are unemployed or out of labor force (Kang & Kim, 2014). Second, as in the case of other countries, the reduction in employment rate was greater for women than for men during the pandemic (Lee & Yang, 2022). These two factors together may have contributed to greater negative effects on pension expenditure for women. In the long-term, women would generate lower lifetime earnings and experience greater economic



**Fig. 6.** Expenditure Analysis by Gender and Age among Single-Person Households, Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . P-values are based on wild cluster bootstrap (Cameron and Miller, 2015) with 10,000 replications based on 7 industry clusters. Q1: 1st quarter of 2020. Q2: 2nd quarter of 2020. Q3: 3rd quarter of 2020. Unit is in 10,000 KRW, about 9 USD. Total expenditure: total consumption and non-consumption expenditure. Total consumption: expenses spent for the purchase of goods and services for everyday household needs.

insecurity relative to men.

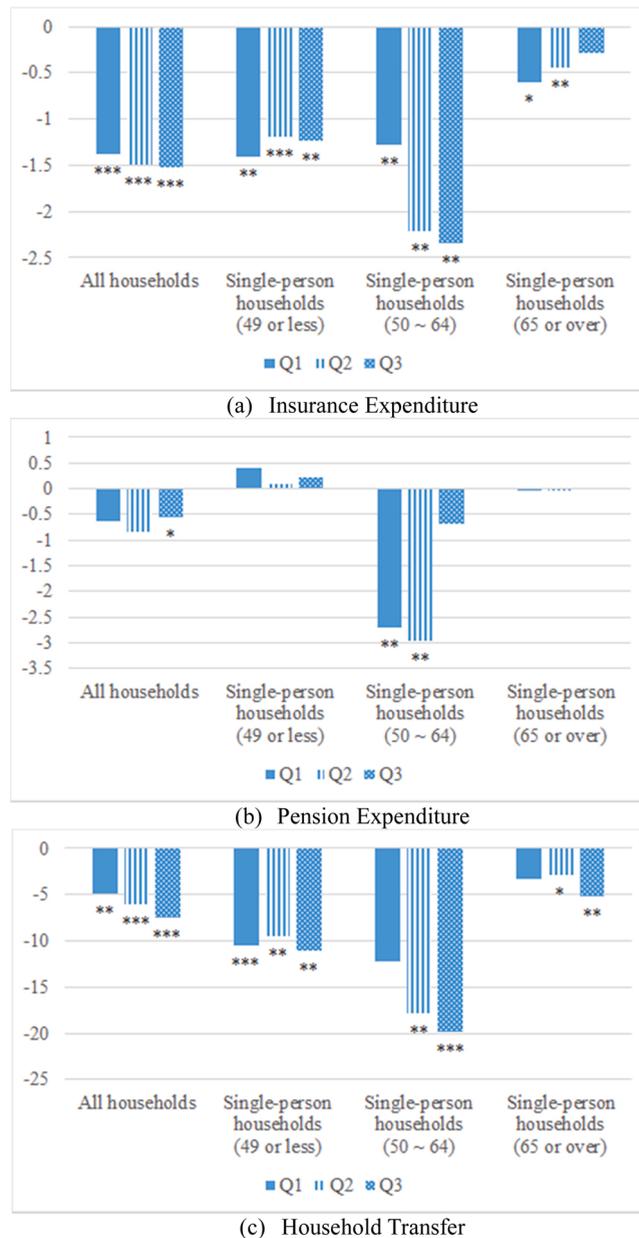
Could the effects on pensions be explained by government responses? Employed persons' national pension contributions are automatically deducted from salary. Unemployed persons can set their own payment to national pension. According to the National Pension Service, individuals and employers could apply for an exemption to contribution before and during the pandemic, to avoid the penalty for late payments. While the conditions for exemption before the pandemic included job loss or business closure, they were expanded in early 2020 to include "significant income loss compared to the same month last year". Then the contributions could be withheld for January through June of 2020 without paying for late-payment penalties (pension value would still decrease for missing payments). Between March and July of 2020, 224,983 exemptions were granted, which is almost a two-fold increase compared to the 101,200 exemptions granted during the same time in 2019 (S. Hwang, 2020). However, even before the pandemic, pension payments were not strictly enforced, in which almost 10 million individuals and 3 million employers missed on their contributions between 2011 and 2020 (H. Park, 2020). In addition, during the pandemic in 2020, 70% of the exemptions were granted to employers (S. Hwang, 2020). We, therefore, believe that the effects of the National Pension policy on individual pension expenditure were muted.

Our results show that the reduction in pension expenditure is almost 40,000 KRW for female middle-aged single-person households. According to the estimates provided by the National Pension Service,<sup>5</sup> for a person with a monthly income of 2255,530 KRW (an average for this age group; see Table 1), reduction in pension payment by 40,000 KRW for 15 years results in approximately 40,000 KRW in monthly receipts after retirement. Given that expected lifespan of woman in Korea is 86,<sup>6</sup> and assuming 2.5% inflation rate, present value of lifetime reduction in pension payment from 65 to 86 is approximately 687,382 KRW, or approximately 573 USD (1 USD = 1200 KRW).

Reduction in payments for health insurance may also have negative effects on income and well-being. Literature shows that without health insurance, individuals are less likely to be screened for serious illnesses, not receive appropriate health care at earlier stages of illnesses and have poorer health outcomes in general. Reduced health insurance coverage can lead to poor health, impairing individual's ability to generate income and directly lowering well-being (Hadley, 2006; Sommers, Gawande, & Baicker 2017).

<sup>5</sup> See <https://csa.nps.or.kr>.

<sup>6</sup> Statistics Korea life table 2021. See: [https://kostat.go.kr/portal/korea/kor\\_nw/1/6/9/index.board](https://kostat.go.kr/portal/korea/kor_nw/1/6/9/index.board)

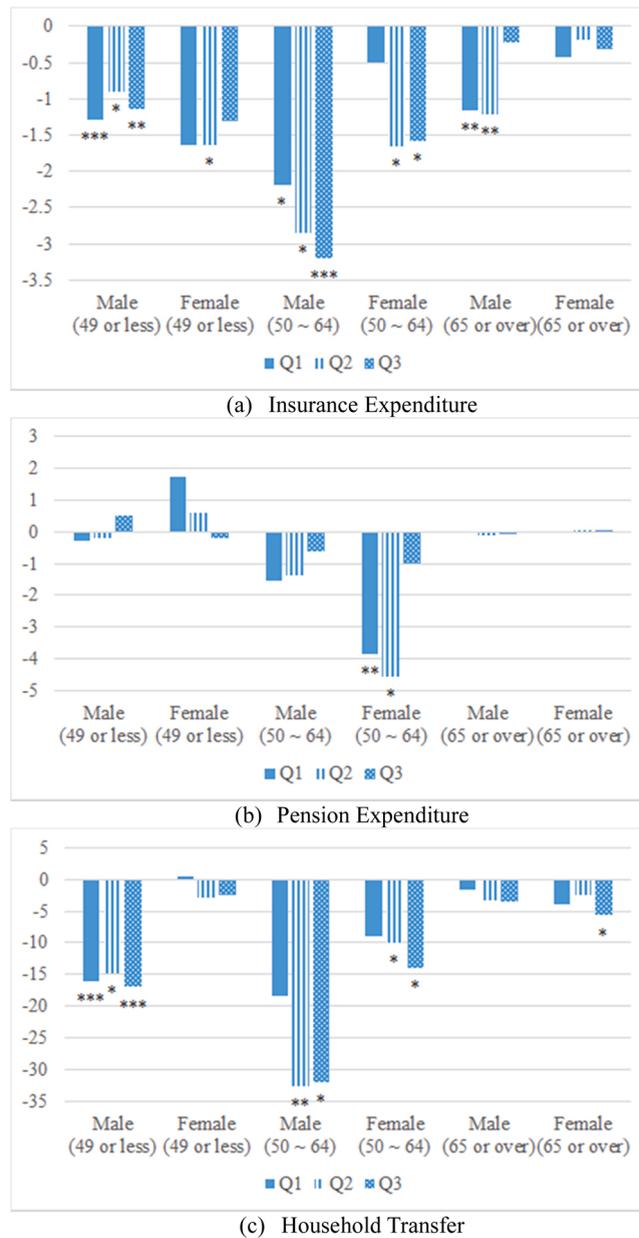


**Fig. 7.** Non-Consumption Expenditure Analysis by Household Type and Age. Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . P-values are based on wild cluster bootstrap (Cameron and Miller, 2015) with 10,000 replications based on 7 industry clusters. Q1: 1st quarter of 2020. Q2: 2nd quarter of 2020. Q3: 3rd quarter of 2020. Unit is in 10,000 KRW, about 9 USD. Non-consumption expenditure: expenses spent on taxes, public pensions, social insurance, and household transfers.

Quantifying the effects of reduced health insurance expenditures would require assumptions about health, mortality, and the value of life, well beyond the scope of the current study.

Figures also show that there were sizable and large reductions in household transfers. Delay or cancelation of social events such as weddings would account for some of the effects in the overall sample. However, the reductions were much greater for single-person households, especially for the middle-aged group. Furthermore, these reductions are driven mostly by middle-aged men, followed by young men aged 49 or less. For middle-aged men the reduction is as much as 320,000 KRW per month in the second and the third quarter of 2020. Assuming each gift is between 50,000 and 100,000 KRW, this amounts to at least 3 fewer gifts given per month, or three fewer events attended, and as much as half of average household transfers made by middle-aged individuals in 2019.

While researchers note that household transfers consist of cash gifts or “mutual aid” between relatives and friends (T. Y. Lee, 2020), it also includes other items such as transfers to children or elderly parents. Based on available data, it is difficult to decompose the reduction in household transfers to the reduction in “mutual aid” transfers and the transfers to children or parents. Reduction in



**Fig. 8.** Non-Consumption Expenditure Analysis by Gender and Age among Single-Person Households. Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . P-values are based on wild cluster bootstrap (Cameron and Miller, 2015) with 10,000 replications based on 7 industry clusters. Q1: 1st quarter of 2020. Q2: 2nd quarter of 2020. Q3: 3rd quarter of 2020. Unit is in 10,000 KRW, about 9 USD. Non-consumption expenditure: expenses spent on taxes, public pensions, social insurance, and household transfers.

“mutual aid” transfers is consistent in motivation with the reduction in pension and insurance, substituting future consumption security for immediate consumption needs. Transfers to young children or elderly parents based on altruism would not serve consumption-smoothing purposes. We, therefore, caution the readers that the evidence from household transfers is suggestive.

### 7. Discussion

We show that single-person households have been heavily affected by the pandemic, and that they reduced non-consumption expenditures related to consumption-smoothing mechanisms. Considering their weak informal insurance mechanism (Crossley, Fisher, & Low, 2021; Piyapromdee & Spittal, 2020), it is likely that they have become even more vulnerable to future economic shocks.

Among single-person households, middle-aged groups experienced greater reductions in income and consumption. They are less likely to be targeted by public welfare programs compared to the old and less likely to receive assistance from friends or the parents

compared to the young (Chang, 2015; Horioka, 2021), making it more difficult for them to recover from negative effects compared to those in other age groups. Further, as discussed in Section 3, both married and unmarried middle-aged individuals came to live alone because of economic difficulties. In the appendix, we show that those who live alone while still being married (because of separation, or to support children's education) experience more reduction in income and expenditure during the pandemic compared to those who are not married (Table A26 to Table A28).

While both middle-aged men and women living alone reduced non-consumption expenditures, men reduced insurance expenditures and household transfers more than women. These results stand in contrast to other studies showing that women tended to suffer more during the current pandemic compared to men (Adams-Prassl, Boneva, Golin, & Rauh, 2020; Belot et al., 2021). One possible explanation is that middle-aged men's social network in Korea relies more on formal social events and were more affected by the social distancing during the pandemic than the younger single-person households and the women who may have stronger informal social networks.

Some of our results, such as the negative effects on travel consumption and small effects on food consumption, are consistent with the findings in the literature (Campos-Vazquez & Esquivel, 2021; Sheridan et al., 2020; Shin et al., 2021). Greater reductions in expenditure by the young and middle-aged single person households are different from Sheridan et al. (2020), for example, who showed that the elderly reduced spending the most on retail, leisure, and public transportation in Denmark and Sweden. One possible explanation for this difference is that the elderly in Korea spend the least on traveling among all age groups, relying heavily on public transportation which is often provided free-of-charge or with a large discount to those 65 or above.

Some of the effects on income and expenditure may have been driven by the government stimulus in the second quarter of 2020, implying that our estimates understate the negative effects of the pandemic. The one-time stimulus payment was worth up to 1 million KRW (approximately 873 USD) per household, restricted to local off-line small-business spending. This was analyzed by Kim & Koh, 2020 using Seoul residents' card expenditure, who found that offline card spending increased by 21.6% one week after the disbursement, but the impact dissipated over the next five weeks. The stimulus did not affect spending in sectors not covered by the stimulus. Kim and Lee (2021) analyzed the same policy using a nationally representative survey conducted in the last week of June 2020. The stimulus payment was most often spent on groceries (46%), followed by restaurants (24%), and medical payments (12%). Given that the effects of the stimulus dissipated within weeks after payment and concentrated to spending on necessities, it would not be able to entirely explain the positive effects on groceries spending that were persistent throughout the first three quarters of 2020, and the effects on other spending categories.

As a robustness check, we estimate propensity score-weighted regression to address differential treatment bias. These results on income and expenditures are presented in the appendix (Table A29 to Table A33). These results are comparable to the main results in Fig. 3 to Fig. 8.

We acknowledge that some single-person households may have chosen to live together during the pandemic. On the one hand, people may have chosen to live with other family members to save living costs. Then, the remaining single person households in 2020 would consist of those who do not have access to assistance from other family members. They would be more vulnerable to economic shocks, as in the case of young single person households (Yeung & Cheung, 2015). On the other hand, those who choose to live alone may be less affected by economic hardships compared to those who decided to live with their families (Seoul Institute, 2022). It is therefore difficult to determine whether the sample represents more vulnerable segment of the population or not. Although we were unable to find evidence suggesting that there were significant increases or reductions in the number of single person households with the start of the pandemic, we nevertheless caution readers that our estimates may be biased from this source.

## 8. Conclusion

We investigate the effects of the COVID-19 pandemic on multiple income and expenditure categories in South Korea with a focus on single-person households. Our expenditure analysis includes cash transactions and household transfers, moving beyond financial transaction data often studied in COVID-19 literature. Since single-person households lack an intra-household informal insurance mechanism, they are likely to be more vulnerable to economic and social disruptions. Unique circumstances that gave rise to single-person households further imply that middle-aged single-person households may be even more vulnerable compared to those in other age groups.

Consistent with our expectations, we find that single-person households experienced more negative effects on income and expenditure compared to multi-persons households. Middle-aged single-person households, between ages 50 and 64, experienced a greater reduction in income and expenditure than those in other age groups. Among the middle-aged, men experienced greater reductions than women. Expenditures on necessities were not heavily affected.

Negative effects on expenditure were driven by the reduction in non-consumption expenditure such as insurance expenditure, pension expenditure, and household transfers. Since these are indicative of informal insurance mechanisms, single-person households would be even more vulnerable to future economic and social disruptions.

Some caution is warranted in the interpretation of our results. First, we employ the difference-in-differences design, which crucially relies on the parallel trend assumption. Due to data limitations, we do not explicitly test for this in the expenditure analysis. Second, we do not observe detailed spending categories of household transfers, making our interpretations suggestive. Third, while we suggest potential reasons for heterogeneous impacts by age and gender, more research is required to fully understand the source of heterogeneity. Fourth, we do not account for potential adjustments in single-person household statuses before and during the pandemic. Finally, given the rapid increase in the proportion of single-person households around the world, our findings on single-person households should be tested in the context of other countries.

## Conflict of interest

Authors declare no conflict of interest.

## Data Availability

The data that support the findings of this study are available upon request from authors and are derived from resources publicly available at the Microdata Repository Service of Statistics Korea at <https://mdis.kostat.go.kr/>.

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## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.asieco.2022.101557](https://doi.org/10.1016/j.asieco.2022.101557).

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