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Author name: Taiwon Ha (PhD Economics)

Affiliation: Ministry of Economy and Finance, Republic of Korea

Address: Government Complex, Sejong-si, Republic of Korea

taiwon.ha@gmail.com

ORCID identifier 0000-0001-6243-6967

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Abstract

Although several studies highlighted the disproportionate effects of the pandemic on household income, its effect on household wealth has been largely disregarded. This study investigated household wealth heterogeneity in Korea using unconditional quantile regression in 2020-2021. These findings indicate that self-employed workers maintained their net assets through targeted fiscal support. However, low-educated workers, poor households, and old households suffered economic damage. Second, unemployed people experienced severe decreases in net wealth due to the pandemic. Lastly, home-owning households in the capital region earned more assets because of asset market booms. Therefore, it suggests inclusive fiscal support to alleviate wealth disparities.

Keywords: COVID-19, disproportionate effect, South Korea, unconditional quantile regression, wealth inequality

JEL code: D31

1. Introduction

Several seminal studies have been highlighted the effects of COVID-19 on the labour market and household income. They have commonly documented that the pandemic delivered disproportionate effects, and the economically vulnerable, such as low-educated, low-skilled, and low-income workers, experienced much severe negative impacts (Adams-Prassl et al., 2020; Palomino et al., 2020). South Korea (hereafter Korea) also suffered from heterogeneous negative impacts on the labour market during the pandemic (Aum et al., 2021; Ha, 2023; Nam and Lee, 2020).

In this context, they insisted that the government should provide more financial support to the damaged groups in a timely and inclusive manner (International Monetary Fund [IMF], 2021; Organisation for Economic Co-operation and Development [OECD], 2020). Therefore, several governments have expanded public transfer programmes for their citizens to alleviate the negative shocks on household income (Blundell et al., 2022; Brewer and Tasseva, 2020; Ha, 2023; Han et al., 2020; Prady, 2020).

However, the effects of the pandemic and the response measures on household wealth have been largely disregarded. Presumably, the distributional effect of the pandemic and the expanded measures deliver the following two types of influence on household wealth. On the one hand, damaged households may liquidate their assets or increase debt to maintain their consumption in response to this temporary income shock, according to the life cycle hypothesis or the permanent income hypothesis. In this case, their net wealth may have reduced during the pandemic. On the other hand, the recent global asset market boom has increased the monetary value of household assets (Blundell et al., 2022; IMF, 2022). Therefore, wealthy households would have earned relatively more assets than before the pandemic.

In this regard, this study examined the impact of the pandemic on household wealth in

Korea. The remainder of this paper is organised as follows. Section 2 introduces wealth inequality, the economic effects of the pandemic, and the response measures in Korea. Section 3 describes the Korean Household Finance and Living Conditions Survey (HFLCS) as the main dataset and unconditional quantile regression (UQR). Section 4 presents the main findings. Lastly, section 5 discusses policy implications, and section 6 summarises the study.

2. The COVID-19 pandemic in Korea

2.1. Household wealth inequality in Korea

Existing literature documented that Korea's household wealth is relatively equally distributed compared to that of other Asian countries or developed economies (Jeong and Cheon, 2017; Jung and Kang, 2021; Zhuang, 2023). However, recently, the Gini coefficient of net household wealth has increased slightly from 0.584 in 2017 to 0.603 in 2021, while the Gini coefficient of household income has improved from 0.354 in 2017 to 0.333 in 2021 owing to expanded public transfer programmes (Choi and Park, 2022; Statistics Korea [KOSTAT], 2023).

Compared to household income inequality, household wealth disparity has not been a highlighted research issue. In recent times, as described in section 3.1, the KOSTAT developed the HFLCS and it encouraged researchers to investigate household wealth issues in Korea. They primarily tracked the effects of householders' socio-economic characteristics (i.e., age, gender, educational attainment, and jobs) and household's economic status (i.e., home ownership and financial assets) on net household wealth (Jeong and Cheon, 2017; Jung and Kang, 2021; Lee et al., 2020; Shin, 2020). In particular, they focused on home ownership as the main contributor to household wealth because Korean households exhibited a significantly strong and consistent preference for real estate assets over financial assets (Choi and Park, 2022; Jeong, 2019; Jeong and Cheon, 2017; KOSTAT, 2023; Park and Jin, 2020). Moreover, considering the regional housing market gap between the capital area and non-

capital regions, a few studies have included region as an explanatory variable (Choi and Park, 2022; Jeong, 2019; Park and Jin, 2020). Consequently, they documented that home ownership and region are the main determinants of the wealth gap among Korean households (Choi and Park, 2022; Jeong, 2019; Jeong and Cheon, 2017; Park and Jin, 2020).

These studies have mainly examined the causal effects of the mean or aggregated index (i.e., Gini coefficient). However, they could draw limited implications for wealth heterogeneity for policymakers and lawmakers because they did not sufficiently capture the distributional effects on household wealth. This study utilised unconditional quantile regression to identify the disproportionate effect of the pandemic on household wealth. Meanwhile, Park and Jin (2020) employed unconditional quantile regression to examine the long-term effects of socio-economic variables on household wealth in Korea. They analysed the Korean Labour and Income Panel Study 2001-2017, using a fixed-effects model. Meanwhile, this study analyses the HFLCS 2020-2021 to capture short-term changes during the COVID-19 pandemic and track more recent changes in household wealth heterogeneity. Furthermore, the HFLCS is considered a more reliable and specific dataset of household wealth, as described in section 3.1 (Jeong, 2019; KOSTAT, 2023). This study also conducted the Least Absolute Shrinkage and Selection Operator (LASSO) to select more relevant independent variables, as expressed in section 3.4 (Tibshirani, 1996).

2.2. The COVID-19 pandemic and response measures

2.2.1. The COVID-19 pandemic

Before the omicron outbreak, Korea had successfully controlled the pandemic with the 3T strategy, which involved testing, tracing, and treating. In this stable environment, the Korean government implemented social distancing measures instead of lockdowns. Meanwhile, Korea maintained stricter regulations on social gatherings than on workplaces. For example, according to the COVID-19 Government Response Tracker system, Korea recorded 3.2 out

of the 5.0 point (a higher point means stricter regulations) for social gatherings between April and December 2020. In contrast, the score for workplace regulation was only 1.6 point, equivalent to half of the social gatherings. The restriction gap in Korea is much greater than in other developed countries. For example, the United States (3.8 and 3.8 on social gathering and workplace, respectively), the United Kingdom (4.0/3.8), and Germany (3.9/3.8) instituted a similar level of regulation on social gatherings and workplaces (Oxford University, 2022).

Due to stricter regulations on social gatherings, self-employed workers experienced greater tangible negative damage (Ha, 2023; Nam and Lee, 2020). For instance, their annual average operating profit per a business entity sharply decreased by 39.0% from 27.4 thousand USD (hereafter 1 USD = 1,200 Korean Won [KRW]) in 2019 to 16.7 thousand USD in 2020 (KOSTAT, 2023). Moreover, they had experienced a more severe economic environment before the pandemic. For example, the annual household income of self-employed workers stagnated at approximately 80% of that of permanent workers since 2019 (KOSTAT, 2023). The Korean Unemployment Insurance Programme covered less than 1 per cent of self-employed workers in 2020 (Noh et al., 2021). Meanwhile, the ratio of self-employed workers (24.6 per cent) in the Korean labour market in 2019 was much greater than in other developed countries, such as 6.1 per cent in the United States, 9.6 per cent in Germany, 10.0 per cent in Japan, and 12.2 per cent in France (OECD, 2022). The economic vulnerability of self-employed workers has long been considered an important issue in Korea.

2.2.2. Response measures

In response to the negative effects of the pandemic, the Korean government introduced expansionary fiscal and monetary measures equivalent to 16 per cent of the national Gross Domestic Product (GDP) (Ministry of Economy and Finance in Korea [MOEF], 2020). For example, the Bank of Korea (BOK) rapidly reduced its official base interest rate from 1.25 per cent to 0.5 per cent to alleviate financial difficulties (BOK, 2022). In addition, the Korean

government distributed several targeted support programmes of 14.6 billion USD for damaged self-employed workers and a universal benefit of 11.9 billion USD for general citizens (MOEF, 2022).

In terms of fiscal programmes, first, the targeted benefits for self-employed workers restricted their income/sales eligibility to concentrate on small- or medium-sized business entities. For example, the Korean government implemented a new hope benefit for 2.5 million self-employed workers nearly the bottom 50% of business owners. This benefit was 833 USD for the general sectors or 1,667 USD for the damaged sectors related to social distancing measures, such as restaurants and other face-to-face industries. This benefit was distributed between October and November 2020. Furthermore, considering the long-lasting damage from the pandemic, the Korean government distributed an additional benefit to the bottom 50% of small business owners January 2021. The benefits ranged from 833 USD to 2,500 USD for each business entity. In this regard, the bottom 50% of self-employed workers could receive both the targeted benefit for business owners and the universal benefit for general citizens.

Second, a universal benefit was paid to every household mainly as a direct deposit on a credit/debit card or cash between May and August 2020. The amount of the benefit was proportional to household size regardless of household income; for example, 333 USD for a single household and 500 USD, 667 USD, and 833 USD for households with two, three, and four or more members, respectively. This universal benefit also aimed to indirectly help small local business owners by facilitating local consumption. Specifically, recipients must spend this benefit at small local stores by the end of August 2020.

2.2.3. Economic effects and the asset market boom

The Korean economy has shown robust resilience to this severe pandemic (IMF, 2021; MOEF, 2020; OECD, 2020). For instance, the real GDP growth rate temporarily decreased

by -0.7 per cent in 2020 compared to the previous year. However, this recession was much milder than that in other developed countries, including -9.3 per cent in the United Kingdom, -3.7 per cent in Germany, and -3.4 per cent in the United States (IMF, 2021). Furthermore, the unemployment rate increased by 0.1 percentage point, from 3.8 per cent in 2019 to 3.9 per cent in 2020. This increment was more stable than in other developed economies such as 4.4 percentage point in the United States, 0.8 percentage point in the United Kingdom, and 0.7 percentage point in Germany (OECD, 2022).

Meanwhile, the Korean economy has experienced an asset market boom closely related to inflated financial liquidity (Blundell et al., 2022; IMF, 2022). For example, the annual house price index in Korea increased by 11.7 per cent in the fourth quarter of 2021, which is higher than the 10.6 per cent increase in the United States, 6.8 per cent in Germany, and 4.0 per cent in the United Kingdom (IMF, 2022). This housing market boom could have important effects on household assets in Korea because Korean households highly prefer real estate assets to financial assets. Specifically, in Korea, real estate assets accounted for 77.5 per cent of household assets in 2021, which is much higher than in other countries (Financial Services Commission in Korea, 2019). This also implies that house price increases can worsen the household wealth inequality between homeowners and renters.

3. Materials and methods

3.1. Data: The Household Finance and Living Conditions Survey (HFLCS)

The HFLCS has been conducted annually by the KOSTAT, the national statistical office in Korea, and the BOK since 2012 as an official dataset in Korea. It collects a wide range of information on the income, expenditure, assets, and liabilities of Korean households to diagnose their financial and economic status (KOSTAT, 2020). The HFLCS has long been regarded as one of the most reliable datasets on household assets in Korea (Jeong, 2019; Jung and Kang, 2021) because it allocates a nationally representative sample of nearly 20,000

households and has complied with administrative data, including tax and welfare benefit data, to improve accuracy and integrity since 2018 (KOSTAT, 2023).

In the HFLCS, household assets and liabilities are measured as the monetary value of assets and liabilities at the end of March in a survey year as stock values, whereas household income and expenditure indicate the financial flows during the previous year (KOSTAT, 2020). For example, the HFLCS 2021 includes household income and expenditure data for 2020 and household assets and liabilities data at the end of March 2021. Therefore, we compared the HFLCS 2020 and 2021 because household assets and liabilities in the HFLCS 2020 represent the economic status of Korean households before the pandemic. Specifically, Korean households recorded higher earned income in the first quarter of 2020 than in the first quarter of 2019. Their earned income decreased from the second quarter of 2020 compared to the same quarter of 2019 (KOSTAT, 2023). Moreover, the monthly unemployment rate stabilised by April 2020. However, the rate in May 2020 was 4.5 per cent, which was higher than 4.0 per cent in May 2019. Therefore, this study assumes that the economic shock of the pandemic primarily affected household livelihoods from the second quarter of 2020.

Table 1 illustrates the characteristics of Korean households. Household income and expenditure increased by 3.4 per cent and 1.3 per cent in 2020 compared to 2019, respectively. However, the value of assets increased considerably more than household income owing to the boom in the housing market. For example, the total and real estate assets increased by 12.8 per cent and 14.4 per cent in 2021, respectively.

[Table 1 here]

3.2. Unconditional Quantile Regression

Ordinary least squares (OLS) regression is a widely used social science research model to estimate the causal effect between independent and dependent variables. However, it is not feasible to sufficiently detect the heterogeneity that is frequently observed in income and

asset datasets (Firpo et al., 2009). Therefore, OLS can extract limited implications regarding potential disproportionate effects on household wealth during the pandemic. Instead, conditional quantile regression (CQR) focuses on the conditional heterogeneous effect on an individual positioned at τ th quantile. However, CQR estimates might also have restricted implications because of the strong assumption that all individuals have the same observed characteristics (Botha et al., 2021; Fournier and Koske, 2012).

Alternatively, unconditional quantile regression (UQR) computes the unconditional quantile effect at τ th quantile without the strong assumptions above (Firpo et al., 2009). The UQR could be a useful research design in this study because household wealth distribution generally illustrates high heterogeneity (Killewald et al., 2017; Park and Jin, 2020). In this context, this study employed UQR to estimate the disproportionate effect of the pandemic on household wealth and extract more practical policy implications.

UQR estimates the impact of marginal changes of independent variables (X) at the quantile in the distribution of dependent variable (Y). Y can be expressed as equation (1). The unconditional partial effect (UPE) means the effect of an infinitesimal shift of the X on the distribution of Y , $v(F_Y)$. UPE can be estimated by equation (2), which includes the Recentered Influence Function (RIF). $RIF(y; q_\tau)$ at τ th quantile can be defined as equation (3). In addition, the unconditional quantile partial effect ($UQPE$) at τ th quantile can be described as equation (4) (Firpo et al., 2009). UQR assumes that $h(\cdot)$ is a strictly monotonic function in ε .

$$Y = h(X, \varepsilon) \quad (1)$$

Note: X is an independent variable vector, ε is a scalar of an unobserved error term, and $h(\cdot)$ is a strictly monotonic function in ε .

$$\alpha(v) = \int \frac{dE[RIF(Y; v)|X = x]}{dx} dF(x) \quad (2)$$

$$RIF(y; q_\tau) = q_\tau + IF(y; q_\tau) = q_\tau + \frac{\tau - 1\{y \leq q_\tau\}}{f_y(q_\tau)} \quad (3)$$

$q_\tau = v_\tau(F_Y) = \inf_q\{q: F_Y(q) \geq \tau\}, IF(.): \text{influence function}$

$$\alpha(\tau) = c_{1,\tau} \int \frac{d \Pr[Y > q_\tau|X = x]}{dx} dF_x(x) \quad (4)$$

$c_{1,\tau} = \frac{1}{f_Y(q_\tau)}$

To illustrate the disproportionate effect of the pandemic on household assets, this paper estimated the marginal change at the 25th, 50th, and 75th percentiles of the net asset distribution of Korean households. Meanwhile, as discussed in section 2.2.2, the 25th and 50th percentiles of self-employed workers received targeted benefits from the Korean government along with universal benefits. Therefore, this study captured the distributional effect of the pandemic and the response measures of the Korean government on self-employed workers.

In addition, it compared the UQPE estimates for 2020 as a pre-pandemic year and 2021 as a post-pandemic year. In other words, if the coefficient increased by 2021 compared to 2020, this study considered the independent variable to have a greater effect during the pandemic. This study utilised the *rifhdreg* user command in STATA published by Rios-Avila (2020).

3.3. Dependent variable

This study employed the monetary value of net assets as the dependent variable to consider both the assets and liabilities of each household (Cowell et al., 2017; Jeong and Cheon, 2017; Killewald et al., 2017; Lee et al., 2020; Park and Jin, 2020). The amount of net assets was calculated as total assets minus total liabilities (KOSTAT, 2020). Meanwhile, we considered

both total assets and total liabilities as dependent variables separately, instead of net assets. However, the strict monotonicity assumption of UQR could be violated because nearly 40% of Korean households recorded zero liabilities. Therefore, this study utilised net assets as the dependent variable.

This variable was then logged to reduce the potential effects of outliers as they were frequently observed in a highly right-skewed household wealth distribution (Cowell et al., 2017). In the HFLCS dataset, some households reported a negative or zero value of net assets when they were in bankruptcy or other economic difficulties. Therefore, this study transformed it using an inverse hyperbolic function to maintain the original order, as expressed in equation (5) (Killewald et al., 2017; Mathä et al., 2017; Park and Jin, 2020).

$$\tilde{x} = \ln(x + \sqrt{x^2 + 1}) \quad (5)$$

3.4. Independent variables

This study conducted the LASSO regression to include more relevant independent variables. In this paper, we first reviewed potential independent variables in previous studies, and then it conducted the LASSO to screen them. As expressed in equation (6), the LASSO is a regularised regression model that minimises the residual sum of squares, subject to an L₁-norm penalty function (Tibshirani, 1996). Consequently, nine independent variables were employed, as listed in Table 2.

$$\beta^{LASSO} = \underset{\beta}{\operatorname{argmin}} \left\{ \sum_{i=1}^n (y_i - x_i' \beta)^2 + \lambda \sum_{j=1}^p |\beta_j| \right\} \quad (6)$$

Note: $i = 1, 2, \dots, n$, λ is a penalty parameter, p is the number of potential variables, and the λ is a penalty parameter and $\sum_{j=1}^p |\beta_j|$ is the sum of the absolute value of potential coefficients in the penalty term of $\lambda \sum_{j=1}^p |\beta_j|$

[Table 2 here]

First, this study selected householders' age, squared age, gender, educational attainment, and job type as independent variables. Job type was categorised into permanent workers, self-employed workers, temporary workers, or unemployed. Because permanent workers had relatively stable effects compared to the other groups (Nam and Lee, 2020), this study designated them as the reference group. We then identified whether self-employed workers experienced more severe effects during the pandemic than other types of workers. In addition, considering labour market dualism, this study also separated temporary workers, who might endure more economic damage than permanent workers. For example, the Unemployment Insurance Programme in Korea covered only 74.4 per cent of temporary workers, which was lower than 94.4 per cent of permanent workers in 2020. In addition, permanent workers earned \$3,078 per month in 2020, but temporary workers received only \$1,350 (Ministry of Employment and Labour in Korea [MOEL], 2022).

Second, this study also employed home ownership, region, ratio of real estate assets, financial balance, household size, and old households to examine household characteristics. Home ownership has been frequently adopted as an independent variable in previous studies as it is considered an essential factor for household wealth accumulation (Blundell et al., 2020; Choi and Park, 2022; Jeong, 2019; Killewald et al., 2017; Mathä et al., 2017; Park and Jin, 2020; Wainer and Zabel, 2020).

In addition, this study also included two complementary homeownership variables. Region was employed to examine the regional disparity in the housing market between the capital area (i.e., Seoul) and non-capital regions. Specifically, the average house price in the capital area was 36.3 thousand USD in 2019, while this figure in non-capital regions was only 16.4 thousand USD in the same year. Furthermore, house prices in the capital area increased by 6.5 per cent in 2020 more than in the non-capital area, which increased by 4.3 per cent in the same year (Korea Real Estate Board [KRB], 2022). Meanwhile, wealthy

households tend to have two or more houses (KOSTAT, 2023), and other real estate assets (i.e., houses for rent) are also the main contributors to wealth inequality (Jeong and Cheon, 2017; Kartashova and Zhou, 2021). However, the HFLCS does not include the number of houses owned by the respondents. In this case, the housing market boom during the pandemic might have been underestimated at higher percentiles by using only the binary home ownership variable. Therefore, this study uses the ratio of real estate assets to household assets as an independent variable.

This study utilised the financial balance as an independent variable, calculated as household income minus household expenditure (KOSTAT, 2020). This is because a household in financial deficit during the pandemic might liquidate its assets or increase loan to support consumption, and then its net wealth might decrease by 2021 compared to 2020. The variable of old households was also employed to investigate further potential implications, considering severe old-age poverty in Korea. The poverty rate among older adults in Korea was the highest among the OECD member countries (OECD, 2022) because the National Pension in Korea was implemented in 1988, much later than in other countries, and covered 47.2 per cent of Korean older adults in 2020 (KOSTAT, 2023). Therefore, their employment rate of 34.1 per cent was also the highest among the OECD members in 2020 (OECD, 2022). In general, as older adults tend to hold a weak position in the labour market, this study examined whether the older Korean population experienced more negative effects during the pandemic.

4. Results

4.1. Householder

Householder age: As illustrated in Table 3, householder age commonly presents significant effects at all percentiles at the 1 per cent level in both 2020 and 2021. According to the life cycle hypothesis or the permanent income hypothesis, a household accumulates financial

resources to smooth consumption during its lifetime; therefore, older adults tend to possess more net assets (Mathä et al., 2017). In this study, net assets increased by 8 per cent as householders aged one more year in 2020. However, this coefficient decreased slightly to 7% at the 25th and 50th percentiles in 2021.

This study then calculated when householders maximised their net assets at the three percentiles in 2020 and 2021. In 2020, 60.7, 70.4, and 76.8 years of age were at the 25th, 50th, and 75th percentiles, respectively; however, this age decreased slightly to 59.3, 69.5, and 73.1 years in 2021. This might indicate that older adults are more likely to utilise their assets to maintain their living costs in response to the temporary economic shock of the pandemic. This finding is consistent with the life cycle and permanent income hypotheses.

[Table 3 here]

Householder gender: Householder gender is statistically significant at all percentiles at the 1 per cent level. Specifically, female householders have smaller net assets than male householders because female workers are in a weak position in the labour market (Ha, 2023; Killewald et al., 2017). For example, a male worker earned \$3,102 per month, while a female worker obtained only \$2,007 per month in 2020 in Korea (MOEL, 2022). This gender gap in the labour market leads to wealth inequality between male and female households. Therefore, female householders possessed substantially smaller net assets of 211.6 thousand USD than male householders' 436.7 thousand USD in 2022 (KOSTAT, 2023). The median coefficient in Korea is much greater than that in the EU countries (Mathä et al., 2017).

Meanwhile, gender disparity decreased at higher percentiles compared to the 25th percentile, indicating that gender inequality was more significant among the economically vulnerable. In addition, the coefficients decreased slightly in 2021 compared to 2020 because the Korean government implemented fiscal support for citizens and self-employed workers regardless of gender, as discussed in section 2.2.2.

Householder education: Householder educational attainment is also significant at all percentiles at the 1 per cent level. A householder, who completed college and above, owned more net assets in both 2020 and 2021 because of the wage gap due to educational attainment in the labour market. For example, in 2020, a university graduate earned \$3,292 per month; however, a worker with a high school diploma received only \$2,036 per month (MOEL, 2022). This is closely related to wealth inequality caused by educational attainment (Jeong, 2019; Jung and Kang, 2021; Killewald et al., 2017; Shin, 2020). For example, households whose heads completed upper secondary schools owned 302.4 thousand USD in 2022, but other households whose heads were university graduates recorded considerably greater net assets, at 534.3 thousand USD (KOSTAT, 2023).

Meanwhile, the education gap on net household assets largely maintained at the 25th, 50th, and 75th percentiles in 2020 and 2021, unlike gender inequality. The pandemic had a disproportionate effect on the labour market, and low-educated and low-skilled workers experienced more severe damage (Adams-Prassl et al., 2020; Aum et al., 2020; Palomino et al., 2020). In general, low-educated workers might suffer from the negative effects of the pandemic; therefore, they might utilise their assets despite the expanded fiscal support programmes.

Householder job type: Householder's job type largely presents significant effects on net assets. First, self-employed workers tended to have similar levels of net assets to permanent workers, who were set as the reference group. In Western countries, self-employed workers usually own business facilities along with their residential properties; therefore, they tend to have more household assets than permanent workers (Killewald et al., 2017; Mathä et al., 2017). However, in this study, the net household assets of self-employed workers in Korea were similar to those of permanent workers because self-employed workers in Korea experienced more difficult economic conditions, as discussed in section 2.2.1. In

terms of the heterogeneous effects, a significant gap remained at the 50th percentile. Moreover, although this effect was insignificant, the gap was reduced at the 25th percentile. However, this coefficient increased at the 75th percentile, which indicates that the Korean government mainly provided fiscal support for the bottom 50% of self-employed workers, as discussed in section 2.2.2; therefore, the 25th and 50th percentiles maintained their net assets. However, the 75th percentile might face relatively more financial difficulties and liquidate their assets to maintain business activities and consumption.

Second, temporary workers document smaller net assets than permanent and self-employed workers. However, the wealth gap was reduced in 2021 at the three percentiles. In response to the economic damage, they might have moved to the platform industry to support their family, such as through food delivery and driving services. For instance, the number of platform workers doubled to 1.8 million in 2020 (Chang, 2020). Temporary workers may have thus mitigated their financial difficulties.

Lastly, unemployed persons also have smaller net assets than permanent workers, and the gap generally decreased in 2021. Fiscal measures could alleviate the wealth gap between permanent workers and unemployed persons. Meanwhile, we observed a greater gap between the 25th percentile and the 50/75th percentiles than self-employed and temporary workers. This implies that the 50th and 75th percentiles may have secured household income, whereas the bottom 25th percentile could not have stable financial sources. Therefore, the Korean government should focus on the 25th percentile of unemployed individuals.

Furthermore, this study conducted an additional analysis to estimate the effect of employment status changes on net household assets during the pandemic. As described in Table 4, it categorised employment changes into four groups: employed in both 2020 and 2021 (the reference group), employed in 2020 – unemployed in 2021, unemployed in 2020 – employed in 2021, and unemployed in 2020 – unemployed in 2021. The employed –

unemployed group exhibited greater net asset decreases at the three percentiles than the other groups. This indicates that this group might have experienced more financial damage due to sudden unemployment during the pandemic, and utilised their assets to make-ends meet. Meanwhile, the unemployed – employed group presents relatively robust changes compared to the other groups.

[Table 4 here]

4.2. Household

Home ownership: Home ownership is a critical factor in determining the amount of net assets, and it is statistically significant at all percentiles at the 1 per cent level in 2020 and 2021. Home ownership presented similar coefficients for 2020 and 2021. Meanwhile, this study identified that home-owning households possessed 76-80 per cent more net assets than tenant households at the 50th percentile. This gap is smaller than that in European countries between 119 per cent in Germany and 278 per cent in Spain (Mathä et al., 2017). As illustrated in Table 3, the 50th and 75th percentiles showed smaller gaps than the 25th percentile. Previous studies have also estimated this pattern because wealthy households are more likely to diversify their asset portfolios from real estate to financial assets (Wainer and Zabel, 2020).

Region: Region is statistically significant at all percentiles at the 1 per cent level. Households living in the capital region owned approximately 39-60 per cent more net assets than other households in the non-capital region due to the housing market disparity between the capital region and other areas. Specifically, as discussed in section 3.4, the price gap increased during the pandemic. Therefore, the coefficient increases in 2021 at the 50th and 75th percentiles. However, the 25th percentile displayed a smaller difference in 2021 because it was more likely to include renters; therefore, they might have faced housing cost increases in the capital area along with the housing market boom.

Real estate: The ratio of real estate assets to household assets illustrates higher coefficients in 2021 than in 2020. With a 1% increase in the real estate ratio, this household owned 0.73-2.03% more net assets in 2020, however, this value increased to 0.91-2.04% in 2021. This indicates that the housing market boom can inflate the monetary value of household real estate assets, particularly for the higher percentiles. Previous studies have also concluded that real estate assets contribute significantly to wealth inequality (Blundell et al., 2022; Choi and Park, 2022; Jeong, 2019; Killewald et al., 2017; Mathä et al., 2017; Park and Jin, 2020; Wainer and Zabel, 2020). This phenomenon explains Korea's strong preference for real estate over financial assets. For example, the ratio of real estate assets to household assets increased slightly from 76.4% in 2020 to 77.5% in 2021 (Table 1).

Financial balance: A household with a financial deficit owned 8-27 per cent significantly smaller net assets than a household with a financial surplus in 2020 and 2021. However, the 25th percentile and the 50/75th percentiles displayed different changes between 2020 and 2021. The 25th percentile experienced a greater net asset decrease in 2021 than that in 2020, whereas the coefficients of the 50th and 75th percentiles increased slightly in 2021. This indicates that a household with a financial deficit in the 25th percentile may have liquidated its assets to maintain living conditions during the pandemic.

This study conducted another analysis to examine the effect of changes in the household debt ratio on net household assets. Households could utilise their net assets or increase debt in response to economic damage from the pandemic. This analysis focused on the latter case. It separated into two groups: the debt ratio increase group and other households (the reference group). As Table 5 illustrates, the 25th percentile of the debt ratio increase group faced a greater net asset decrease than the 50th and 75th percentiles, which indicates that vulnerable groups may have faced more severe financial difficulties.

[Table 5 here]

Household size: The number of household members is also significant at all percentiles at the 1 per cent level for both 2020 and 2021. Specifically, if a household had one more member, its net assets increased by 7-19 per cent. In general, a single household is more likely to have smaller net assets than a couple or a household with children (Choi and Park, 2022; Killewald et al., 2017). This coefficient presents a slightly higher value in 2021 than in 2020. The universal benefit was proportional to the number of household members, as discussed in section 2.2.2; therefore, it could present a higher coefficient during the pandemic.

Old household: Lastly, old households owned more net assets than working-age households because a household tends to accumulate assets to smooth their lifetime consumption. This variable recorded smaller coefficients in 2021 than in 2020. As discussed in section 3.4, the older Korean adults are forced to participate in the labour market to make-ends meet. However, owing to the negative effects of the pandemic, their unemployment rate increased from 3.2 per cent in 2019 to 3.6 per cent in 2020, whereas the unemployment rate in the entire labour market increased slightly from 3.8 per cent in 2019 to 3.9 per cent in 2020 (KOSTAT, 2023). This is because older adults generally have a weak position in the labour market and might voluntarily reduce their labour activities due to health concerns. Thus, they might utilise their assets to support their living costs due to financial difficulties.

5. Discussion

This section presents some implications of the main findings. First, the government's response measures largely mitigated the financial damage to Korean households. As noted in Table 3, the financial balance variable illustrates similar effects on net assets in both 2020 and 2021, despite the negative impacts of the pandemic. The relatively stable economic conditions in Korea and the fiscal measures provided by the government might maintain the financial conditions of Korean households, similar to the United Kingdom (Blundell et al, 2022). Moreover, the ratio of deficit households among all households decreased slightly

from 14.9 per cent in 2020 to 14.0 per cent in 2021 despite the pandemic. However, the 25th percentile of financially deficient households experienced a greater decrease in their net assets by 2021 than by 2020. This indicates that the 25th percentile was required to liquidate assets to support their living conditions, even though the Korean government expanded fiscal support programmes. Therefore, response measures should be more inclusive to support vulnerable groups.

Second, the job type of the householder documents a different effect on household wealth. Although self-employed workers experienced more severe impacts than permanent workers in the labour market (Ha, 2023; Nam and Lee, 2020), they had a mild effect on household wealth. The government's response measures largely aimed to support small- and medium-sized self-employed workers, mainly the bottom 50%. Consequently, this support could mitigate the negative effects of the pandemic on household wealth.

Third, old households face a severe decrease in their net assets compared to working-age households. Although old households have more net assets than working-age households, the wealth gap decreased during the pandemic. The National Pension in Korea provides a limited coverage for older Korean adults (47.2 per cent in 2020), who hold a weak position in the labour market. Therefore, in response to the pandemic, they had to liquidate their assets to make-ends meet. These results imply that government's financial support should be provided to older adults.

Fourth, we observed that the region and ratio of real estate assets presented more significant effects on net household assets. This indicates that the wealth inequality between homeowners in the capital area and other regions deteriorated during the pandemic. Globally, several governments have implemented expansionary measures to support vulnerability, which could reduce income inequality (Brewer and Tasseva, 2020; Han et al., 2020; Prady, 2020). This, however, triggered the asset market boom (Blundell et al., 2022; IMF, 2022).

Meanwhile, during the Global Financial Crisis in 2008 originated from the housing market crash in the United States, and home ownership had negative effects on household wealth (Kartashova and Zhou, 2021; Wainer and Zabel, 2020).

Lastly, as a long-term measure, the Korean government should introduce fundamental measures to alleviate wealth inequality. As described in Table 3, socio-economic characteristics, such as gender, educational attainment, home ownership, and region, significantly affected wealth inequality in 2020 and 2021. Even though fiscal measures during the pandemic partially mitigated wealth inequality in 2021, the response measures were temporary. More fundamental and inclusive measures should be implemented to relieve wealth inequality.

6. Conclusion

The pandemic had disproportionate effects on the labour market and household income as concluded in several prior studies. However, its effect on household wealth has been largely disregarded. Therefore, this study explores the heterogeneous effects of the pandemic on household wealth in Korea. Financial support, which was concentrated among self-employed workers who had experienced tangible damage from the pandemic, effectively covered their economic damage. However, low-educated workers, the bottom 25th percentile household with a financial deficit, old households, and households whose heads had found themselves suddenly unemployed because of the pandemic still suffered from financial difficulties. Therefore, this study suggests inclusive actions to support vulnerable groups.

This paragraph describes the limitations of this study. First, we did not investigate the effects of assets and liabilities on household assets, separately. Specifically, nearly 40% of Korean households presented a zero value of liabilities, which can violate the strong monotonicity assumption of UQR, as discussed in section 3.3. Therefore, this study employed net assets, calculated as assets minus liabilities, and conducted an additional analysis. Second,

we did not track more other short-term effects on net household assets, such as quarterly changes. Studies have examined quarterly income changes during the pandemic using data from the quarterly Korea Household Income and Expenditure Survey (Ha, 2023; Nam and Lee, 2020). The HFLCS is the most reliable dataset and the only official statistics on household wealth. However, as this is a yearly survey, quarterly changes could not be tracked.

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Table 1. Characteristics of the Korean household

Variables	2020	2021
Age (years)	56.07	55.65
Gender (% of male)	0.77	0.76
Educational attainment (% of below college)	0.57	0.56
Householder (% of permanent workers)	0.42	0.43
Job type (% of temporary workers)	0.12	0.12
(% of self-employed workers)	0.22	0.23
(% of unemployed)	0.24	0.23
Home ownership (% of home-owning households)	0.61	0.61
Financial balance (% of households with a financial surplus)	0.85	0.86
Region (% of household living in the capital region)	0.49	0.49
Household size (persons)	2.64	2.61
Household Old households (% of old households)	0.20	0.19
Income (USD, monthly)	4,113.8	4,253.3
Expenditure (USD, monthly)	2,665.1	2,700.0
Total Assets (USD, thousand)	371.2	418.8
Real estate Assets (USD, thousand)	283.7	324.5
Total Liabilities (USD, thousand)	68.8	73.3
Net Assets (USD, thousand)	302.4	345.4
Observations	18,064	18,187

Note: (a) Coefficients of binary variables: gender of 0.77 means that 77% of householder is male, (b) 1 USD = 1,200 KRW, (c) Income and expenditure: 2019 and 2020; *Source:* Author's calculation (HFLCS microdata)

Table 2. Independent variables

Category	Variable	Description
Householder	Age	age, years
	Age ²	squared age
	Gender	binary, gender, 0=male, 1=female
	Education	binary, educational attainment, 0=below college, 1=college and above
	Job type	job type, 0=permanent workers, 1=temporary workers, 2=self-employed workers, 3=unemployed persons
Household	Home ownership	binary, home ownership, 0=owning, 1=rent
	Region	binary, region, 0=capital region (Seoul and surrounding areas), 1=non-capital regions
	Real Estate	ratio of real estate to household assets
	Financial balance	binary, financial balance (calculated as income – expenditure), 0=surplus, 1=deficit
	Household size	persons, the number of household members
	Old households	binary, 1=if all household members aged 65 and over, 0=otherwise

Table 3. The result of unconditional quantile regression (1)

Variables	2020			2021		
	25 th	50 th	75 th	25 th	50 th	75 th
Householder age (years)	0.08*** [0.01]	0.08*** [0.01]	0.08*** [0.00]	0.07*** [0.01]	0.07*** [0.01]	0.08*** [0.01]
Householder age ² (squared)	0.00*** [0.00]	0.00*** [0.00]	0.00*** [0.00]	0.00*** [0.00]	0.00*** [0.00]	0.00*** [0.00]
Householder gender (0=male)	-0.46*** [0.06]	-0.33*** [0.03]	-0.15*** [0.03]	-0.41*** [0.05]	-0.26*** [0.03]	-0.14*** [0.03]
Householder education (0=below college)	0.69*** [0.05]	0.65*** [0.03]	0.70*** [0.03]	0.66*** [0.05]	0.71*** [0.03]	0.70*** [0.03]
Householder job type (1= self-employed)	-0.01 [0.05]	0.08** [0.03]	0.04 [0.03]	0.06 [0.05]	0.07** [0.03]	0.01 [0.04]
(0=permanent workers) (2= temporary)	-0.91*** [0.08]	-0.50*** [0.04]	-0.34*** [0.03]	-0.78*** [0.08]	-0.45*** [0.04]	-0.31*** [0.04]
(3= unemployed)	-0.71*** [0.06]	-0.14*** [0.04]	-0.07* [0.04]	-0.57*** [0.06]	-0.16*** [0.04]	-0.02 [0.04]
Home ownership (0=owned)	-1.86*** [0.05]	-0.80*** [0.04]	-0.27*** [0.05]	-1.75*** [0.08]	-0.76*** [0.05]	-0.23*** [0.05]
Region (0=capital)	-0.43*** [0.04]	-0.46*** [0.02]	-0.51*** [0.02]	-0.39*** [0.04]	-0.49*** [0.02]	-0.60*** [0.03]
Real estate (% of assets)	2.03*** [0.11]	0.86*** [0.06]	0.73*** [0.06]	2.04*** [0.11]	1.08*** [0.06]	0.91*** [0.06]
Financial balance (0=surplus)	-0.23** [0.06]	-0.14*** [0.03]	-0.10*** [0.03]	-0.27*** [0.06]	-0.11*** [0.03]	-0.08** [0.03]
Household size (persons)	0.17*** [0.02]	0.12*** [0.03]	0.07*** [0.01]	0.19*** [0.02]	0.13*** [0.01]	0.09*** [0.01]
Old households (0=non-older)	0.11* [0.07]	0.24*** [0.04]	0.25*** [0.04]	0.03 [0.07]	0.12*** [0.03]	0.11** [0.04]
Constant	6.32*** [0.33]	7.42*** [0.16]	8.03*** [0.15]	6.61*** [0.34]	7.59*** [0.17]	8.31*** [0.16]
R-squared	0.40	0.35	0.22	0.41	0.36	0.23
Observations	18,063			18,187		

Note: (a) coefficients and standard errors (in square brackets), (b) * p-value < 0.1, ** p < 0.05,

*** p < 0.01; Source: Author's calculation (HFLCS microdata)

Table 4. The result of unconditional quantile regression (2)

Employment status change (in 2020 – in 2021)	2021		
	25 th	50 th	75 th
Employed – Employed (reference group)	-	-	-
Employed – Unemployed	-0.56*** [0.12]	-0.76*** [0.06]	-0.11* [0.06]
Unemployed – Employed	-0.08 [0.13]	-0.15** [0.06]	0.02 [0.06]
Unemployed – Unemployed	-0.54*** [0.08]	-0.12** [0.04]	0.00 [0.05]
R-squared	0.41	0.37	0.23
Observations	13,793		

Note: (a) Coefficients and standard errors (in square brackets), (b) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (c) Other independent variables in Table 3 were applied; *Source:* Author's calculation (HFLCS microdata)

Table 5. The result of unconditional quantile regression (3)

Household debt ratio changes (2021 compared to 2020)	2021		
	25 th	50 th	75 th
No changes or decrease (reference group)	-	-	-
Increase	-0.13*** [0.05]	-0.09*** [0.03]	-0.08*** [0.03]
R-squared	0.41	0.37	0.23
Observations	13,793		

Note: (a) Coefficients and standard errors (in square brackets), (b) * p-value < 0.1, ** p < 0.05, *** p < 0.01, (c) Other independent variables in Table 3 were applied; *Source:* Author's calculation (HFLCS microdata)