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AN ANALYSIS OF STOCKPILING BEHAVIOR AT THE ONSET OF THE COVID-19 PANDEMIC

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Abstract

Excessive stockpiling due to panic buying during emergencies such as natural disasters and pandemics can increase pressure on supply chains and exacerbate supply shortages. This study uses household level purchase data from the United States to analyze the extent of stockpiling on dry food (rice and pasta) at the onset of the COVID-19 pandemic period in March 2020. The results show significant differences in the extent and timing of stockpiling among different demographic groups. Among the elderly and low-income households, the increase in purchases is substantially smaller and occurs with a lag compared to other population groups, suggesting that these vulnerable populations may be at a particular disadvantage in accessing essential goods during a crisis. The managerial and public policy implications of this "stockpiling inequality" are discussed.

Anahtar Kelimeler: Consumer Behavior, Stockpiling, Panic Buying, COVID-19, Observational Data, Panel Data Methods, Empirical Methods

JEL Kodları: D12, J68, L66

COVID-19 PANDEMİSİNİN BAŞLANGICINDAKİ STOKLAMA DAVRANIŞININ ANALİZİ

Öz

Doğal afetler ve pandemiler gibi aciliyet durumlarında hanehalklarının panik alımları tedarik zincirleri üzerindeki baskıyı arttırmakta ve tedarik darboğazlarına yol açabilmektedir. Bu çalışma, Amerika Birleşik Devletleri'nden hane düzeyinde gerçek satın alma verisi kullanarak COVİD-19 pandemi döneminin başlangıcına tekabül eden Mart 2020 döneminde tüketicilerin kuru gıda (pirinç ve makarna) stoklama davranışını analiz etmektedir. Sonuçlar, farklı demografik gruplar arasında stoklama davranışında miktar ve zamanlama açısından önemli farklılıklara işaret etmektedir. Özellikle, satın alımların yaşlılar ve düşük gelirli haneler için diğer demografik gruplara kıyasla önemli ölçüde geride kalması ve gecikmeli olarak gerçekleşmesi, bu hassas toplum kesimlerinin bir kriz sırasında temel mallara erişimde dezavantajlı olabileceğini düşündürmektedir. Çalışmanın sonuç bölümünde bu "stoklama eşitsizliği" ile ilgili işletmeler ve kamu politikası açısından alınabilecek önlemler değerlendirilmektedir.

Keywords: Tüketici Davranışı, Stoklama, Panik Satın Alma, COVID-19, Gözlemsel Veri, Panel Veri Yöntemleri, Ampirik Yöntemler

JEL Codes: D12, J68, L66

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INTRODUCTION

Consumers tend to stock up on essential goods in times of emergency. Some of this stockpiling may be an optimal response to a predicted disruption in the supply of these goods. At the same time, unnecessary panic can fuel excessive stockpiling and lead to product shortages. These shortages may result in inequitable distribution of available supplies, leaving vulnerable populations without access to essential commodities (Hill and Sharma, 2020). In this perspective, the present study examines food stockpiling behaviors during the onset of the COVID-19 pandemic in March 2020 to lay out differences in the timing and quantity of stockpiling among different consumer demographics.

COVID-19 was first observed in Wuhan Province, China, and spread to other countries in Europe and to other continents within a short period of time. The coronavirus outbreak was recognized as a pandemic by the World Health Organization on March 11, 2020. In the days that followed, media reports indicated that consumers were increasingly stocking up on food and household items.

Previous research has examined stockpiling behavior during the COVID-19 pandemic, primarily through survey-based studies that focus on exploring the psychological mechanisms underlying stockpiling behavior. Personal characteristics, including higher risk aversion, external locus of control, stress proneness, and cultural values such as uncertainty avoidance and individualism, have been identified as predictors of the tendency for panic buying (Zhang and Zhou, 2021; Ahmadi, Habel, Jia, Lee and Wei, 2022). In addition, factors such as the perceived severity of the disease, perceived scarcity, and time pressure have been found to positively influence stockpiling intentions (Sadus, Göttmann and Schubert, 2022; Singh, Slack, Sharma and Dhir, 2023). The current article aims complement these findings by focusing on the demographic determinants of panic buying during COVID, using data on actual household-level purchases.

The empirical analysis relies on household-level purchase data for rice and pasta categories from 2019 and 2020, collected by Nielsen. The dataset tracks purchase histories of approximately 50000 registered households selected through stratified random sampling from different geographic markets across the US. The panel households vary in age, income, education, and household size, allowing the researcher to examine changes in consumption patterns based on these demographic characteristics.

To examine stockpiling in the dry food category, a summary measure is constructed for each household based on the sum of rice and pasta purchases in each week. Purchases exhibit a significant spike in the second and third weeks of March 2020, immediately after Covid was declared a pandemic by WHO. This two-week period is referred to in the study as the "panic period". Controlling for seasonal variation and year-to-year differences in consumption (e.g., more eating at home in 2020 due to lockdowns), the regression estimates suggest an average 20% increase in purchase volume during the panic period.

The main results of the study are based on a regression model that accounts for interactions between household demographic characteristics and the time dummy variable indicating the "panic period" defined above. Estimates from this model verify an increase in the order of 20% in dry food purchases during the panic period. Importantly, the estimates reveal significant differences among households in stockpiling behavior. Inventory accumulation is larger for larger households as well as among younger and higher-income consumer groups. Education does not significantly affect the level of stockpiling; after controlling for income and age, a college degree does not predict an increase in the propensity to stockpile.

When the effects of demographic variables are examined separately for the first and second week within the panic period, it is observed that higher-income households and large families tend to stockpile not only larger amounts but also earlier. In particular, a more nuanced split of age groups suggests that the elderly population aged 65 and older did not stockpile at all during the earlier part of the panic period when supplies would be more likely to be still available. These findings point to a potential inequality in building houeshold stocks during times of emergency. In particular, vulnerable households, including the poor and elderly, may not be able to accumulate sufficient stocks of essentials in a timely manner and may need support from businesses and government.

The remainder of the paper is organized as follows. The next section reviews the relevant literature on panic buying. The following section presents the data used in the study. The subsequent sections introduce the econometric model and report results. The final section concludes with a discussion of the findings and implications for business management and public policy.

LITERATURE REVIEW

Panic buying can generally be defined as potentially excessive stockpiling of daily necessities due to fear and panic in anticipation of future shortages. Previous research has shown that such panic buying occurs in the face of natural disasters. For example, during Superstorm Sandy, a major storm event that affected the East Coast of the United States in 2012, anticipated disruptions in gasoline supply triggered panic buying and caused many gas stations to run out of gasoline (Sterman and Dogan, 2015). Similar panic buying occurred in response to other natural disasters (Kulemeka, 2010; Ishida, Maruyama and Kurihara, 2013; Hori and Iwamoto, 2014; Pan, Dresner, Mantin and Zhang, 2020; Cruz-Cárdenas, Zabelina, Guadalupe-Lanas, Palacio-Fierro and Ramos-Galarza, 2021) and government restrictions (Dong and Klaiberb, 2019).

Panic buying can be triggered by various psychological mechanisms. One of these potential triggers is risk aversion due to the perceived risk of not being able to obtain a needed item (Arafat et al., 2020). Such risks that pose a threat to the individual's sense of security, can be an important driver of panic buying (Prentice, Quach and Thaichon, 2022).

Another trigger could be anticipated regret, i.e., the fear that the product will no longer be available and that one did not stock up when the opportunity was there. Yuen, Wang, Ma and Li (2020) also discuss that panic buying can also function as a coping mechanism that gives the individual a sense of control to deal with the fear of uncertainty.

In addition, herd instinct has been shown to contribute to irrational stockpiling: Seeing others stock up on a product or seeing empty shelves in the supermarket can reinforce a sense of urgency and fuel expectations of shortages (Gupta, Nair, and Radhakrishnan, 2021; Papagiannidis, Alamanos, Bourlakis and Dennis, 2022; Prentice et al, 2022). In the context of a pandemic, increasing concerns about contracting the disease and not being able to go shopping may also be a reason for stockpiling (Micalizzi, Zambrotta and Bernstein, 2020). Finally, the influx of conflicting information and visual cues shared in social media (such as images of empty shelves in supermarkets) contribute to the occurrence of panic buying, leading people to exhibit irrational behavior (Chen et al., 2020).

In terms of personal characteristics, higher risk aversion, external locus of control, stress proneness, and cultural values such as uncertainty avoidance and individualism have been found to predict the tendency for panic buying (Zhang and Zhou, 2021; Ahmadi et al., 2022). Stockpiling is also associated with extraversion and neuroticism (Dammayer, 2020). Additionally, perceived severity of the disease, perceived scarcity, and time pressure positively influence stockpiling intentions (Sadus et al., 2022, Singh et al., 2023).

Previous research in this area has been mostly survey-based and thus unable to provide accurate estimates of the extent of panic stockpiling and how, in real-world circumstances, the extent of panic buying varied in timing and intensity across households of different demographics. This study contributes to this line of literature by focusing on the demographic determinants of panic buying using data on actual household-level purchases.

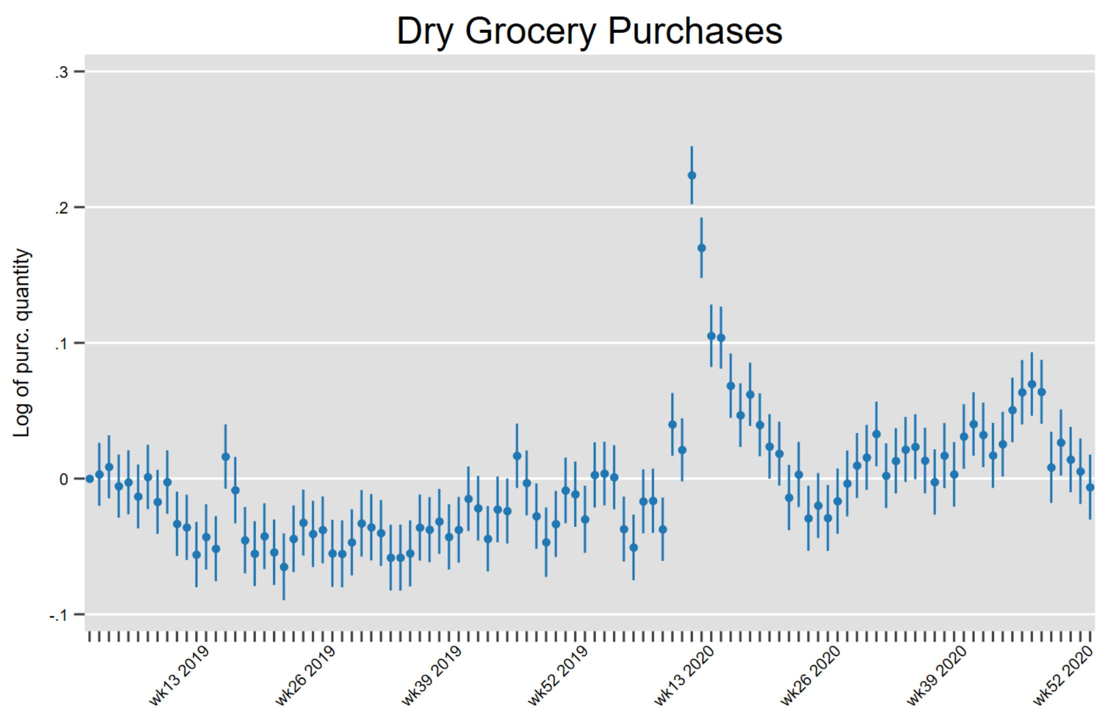
DATA

The study uses 2019 and 2020 purchase records from Nielsen Homescan panel. Access to this dataset is provided to registered academic researchers through the Kilts Center of Marketing. Nielsen selects panel households via stratified random sampling to cover all population profiles. Along with the purchase records demographic characteristics of households such as age of household head, annual income level, number of household members, and education level of household head (separately for male and female household heads) are obtained by Nielsen through yearly surveys.

Table 1: Summary statistics of main variables

	Mean	Std. Dev	Min	Max
Purchase volume (oz.)	42.599	76.515	2	13120
Age	55.488	12.427	23	70
Yearly income (in 1000$)	65.234	28.840	3	100
Univ. graduate	0.558	0.497	0	1
Household size	2.719	1.343	1	9

Figure 1: The Panic period purchase spike



Note: Lines indicate the %95 confidence intervals.

Levels of purchase in the rice and pasta category are taken as a measure of dry grocery inventories. These staple products are the typically stockpiled dry food items in emergency periods and their availability is important to all households regardless of age and income differences, due to their extended shelf life, versatility, and ability to provide sustenance. Several research studies have investigated the stockpiling practices during the COVID-19 pandemic, revealing that rice and pasta were among the most commonly stockpiled emphasizing their significance in ensuring food security and preparedness for potential shortages (Amaral, Chang and Burns, 2022; Naeem, 2021; Prentice, Chen and Stantic, 2020).

The data for this study includes all households that purchased rice or pasta at least once during the sample period, resulting in a total of 54,173 households. The dataset comprises 769,191 household-week level observations, encompassing the years 2019 and 2020. On average, households were observed to purchase pasta or rice in approximately 11.6 of the total 104 calendar weeks covered in the analysis and the average purchase quantity for a purchase occasion is 42.6 ounces. The summary statistics for the main variables related to purchase and household characteristics are provided in Table 1.

The event study plot in Figure 1 shows the purchase spike at the outbreak of the COVID-19 pandemic. The plot reveals that, in the two weeks before the end of the first quarter of 2020, purchases increase significantly, by more than 15% of usual purchase amounts. The empirical model presented in the next section aims to examine demographic and temporal differences among households that moderate this increase.

EMPIRICAL MODEL

To estimate the magnitude of stockpiling due to the coronavirus outbreak and the responses of households of different demographics, the following regression model is employed.

$$ln\ (purch_{ht}) = \beta_{pan}\ I(Panic\ period) + \beta_{panage}\ I(Panic\ period) * age_h + \beta_{paninc}\ I(Panic\ period) * inc_h + \beta_{paned}\ I(Panic\ period) * edu_h + \beta_{panhs}\ I(Panic\ period) * hsize_h + \beta_a age_h + \beta_{inc} income_h + \beta_{ed} edu_h + \beta_{hs} hhsize_h + \beta_{quarter} + \beta_{year} + \varepsilon_{ht} \quad (1)$$

In this model, the dependent variable represents the natural logarithm of household h's weekly dry grocery purchases (of rice and pasta) in week *t*. The logarithmic transformation of the purchase quantity allows the model parameters to be interpreted as percentages.

The main coefficient of interest is β_{pan} which measures the abnormal increase in purchases in the panic period around WHO's declaration of the coronavirus outbreak as a pandemic on March 11, 2020. The variable $I(Panic\ period)$ is an indicator that is equal to 1 for the two-week period from March 8 to March 21, 2020.

The model considers the effects of age, household size, income level and education. Age is represented by the variable age which stands for the age of the household head[2]. The variable $income$ represents the total yearly income of the household. Education level is accounted for by the variable edu, which is a dummy variable that is equal to one if either the male or the female household head has a university degree. Finally, the variable $hhsize$ counts the number of members in household h. The interaction of these variables with the indicator variable $I(Panic\ period)$ measures the differential increase in panic-buying predicted by the respective demographic characteristic. The model also includes as control the main effects of these variables to account for differences in baseline demand for dry grocery products among the different demographic groups[3].

To control for seasonal demand differences, the model includes quarter-of-year fixed effects denoted $\beta_{quarter}$. The year fixed effect β_{year} allows grocery purchases to vary by year, e.g., to be higher in 2020 when home food consumption has increased due to lockdowns. The last term in the equation ε_{ht} is the regression error term. In the following section, I report the estimates for different specifications of this model obtained using ordinary least squares.

RESULTS

Table 2 shows coefficient estimates from regression models based on Equation 1. The specification in Column 1 includes no controls. Column 2 controls for yearly differences and seasonal fluctuations in demand (Column 2). Column 3 additionally controls for the main effects of demographic variables[4]. In Column 4 both fixed effect controls and demographic variables are accounted for. Across these specifications the average increase in purchases during the panic period is estimated to be in the range of 16.7% to 21.4%.

The bottom four rows in Table 2 report coefficient estimates for the interactions of the “Panic period” dummy with the demographic variables. These suggest that larger households accumulate larger stocks, as might be expected. Higher income indicates a higher propensity to stockpile, or in reverse, low-income levels are associated with lower inventories, suggesting credit factors or time inflexibility among these

[2] For households that include a married couple, the variable takes into account the age of the older partner.
[3] Purchase quantity models generally include controls for inventory and consumption rates (e.g., Gupta, 1991; Bucklin, Gupta and Han, 1995; Mela, Jedidi and Bowman, 1998). As the main interest in the current study lies in the interactions between household characteristics and the panic period dummy, such main effects should not have an impact on the findings.
[4] The main effects suggest that rice and pasta are consumed less by younger, more affluent households, whereas larger households and being a college graduate predicts higher consumption amounts.

households that prevent them from building comparable levels of stocks in a timely manner. The results suggest that education level, on its own, does not affect the extent of panic buying.

Table 2: Magnitude of stockpiling by household demographics

	(1)	**(2)**	**(3)**	**(4)**
Panic period	0.195*** (0.00567)	0.167*** (0.00600)	0.172*** (0.00595)	0.214*** (0.0363)
Age			-0.000265*** (0.0000830)	-0.000189** (0.0000842)
Income			-0.000195*** (0.0000355)	-0.000228*** (0.0000360)
Univ. graduate			0.0394*** (0.00203)	0.0396*** (0.00206)
Household size			0.0799*** (0.000779)	0.0795*** (0.000790)
Age # Panic period				-0.00277*** (0.000496)
Income # Panic period				0.00118*** (0.000213)
Univ. graduate # Panic period				-0.00560 (0.0121)
Household size # Panic period				0.0144*** (0.00466)
No. obs.	769191	769191	769191	769191
R squared	0.00153	0.00239	0.0198	0.0200

Notes: Coefficient estimates from OLS models. The dependent variable is the natural logarithm of total weekly household purchases of rice and pasta in ounces. The data include 54,173 households. Columns 2 to 4 include season and year fixed effects. Standard errors indicated in parentheses. ** $p < 0.05$, *** $p < 0.01$.

Results suggest that age has a negative effect on stockpiling quantities, i.e., older households' stockpile less. Note that this estimate is after controlling for income and household size differences, i.e., lower purchases by older households cannot be attributed to the fact that these households are likely to have lower incomes and fewer members. Therefore, other constraints such as a delay in being informed about the pandemic or not being able to take immediate action, which would be relevant particularly for the older population, seem to be at play.

Timing of stockpiling

This section analyzes timing differences in stockpiling. The specifications reported in Table 3 allow the increase in the urchase propensity to vary for the first and the second half of the panic period. Column 1 reports estimates for the average changes in the aggregate. These suggest that purchase amounts were larger by 22.2% during the first week. In the second week, the relative increase is smaller approximately by one fourth, at 16.1%. Accordingly, panic buying purchases appear to be concentrated in the earlier period.

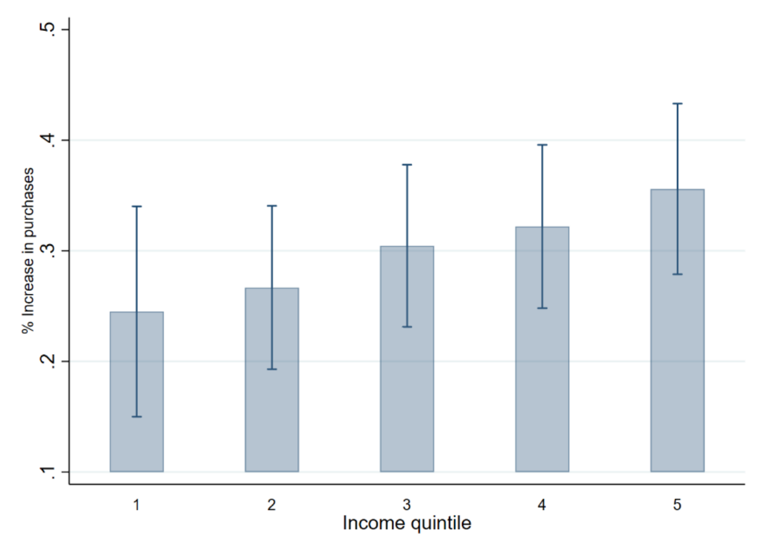
Table 3: Magnitude of stockpiling by household demographics

	(1)	(2)
Panic wk1	0.222*** (0.00757)	0.210*** (0.0491)
Panic wk2	0.161*** (0.00841)	0.272*** (0.0550)
Age		-0.000183** (0.0000842)
Income		-0.000227*** (0.0000360)
Univ. graduate		0.0396*** (0.00206)
Household size		0.0795*** (0.000790)
Age # Panic wk1		-0.00284*** (0.000660)
Age # Panic wk2		-0.00252*** (0.000741)
Income # Panic wk1		0.00163*** (0.000286)
Income # Panic wk2		0.000620** (0.000314)
Univ. graduate # Panic wk1		-0.00311 (0.0162)
Univ. graduate # Panic wk2		-0.00878 (0.0178)
Household size # Panic wk1		0.0185*** (0.00616)
Household size # Panic wk2		0.00809 (0.00701)
No. obs.	769191	769191
R squared	0.00157	0.0206

Notes: Coefficient estimates from OLS models. The dependent variable is the natural logarithm of total weekly household purchases of rice and pasta in ounces. The data include 54,173 households. Models include season and year fixed effects. Standard errors indicated in parantheses. ** p<0.05, *** p<0.01

The second column introduces the interactions of these week dummies with the demographic variables, again controlling for the main effects of these variables. Rows 2 through 6 report the coefficient estimates for the main effects. These estimates are comparable in both sign and magnitude to those obtained from the main model in Table 2.

Figure 2: Stockpiling by income level



Note: Capped lines indicate the %95 confidence intervals.

Rows 7 and 8 report the interaction terms with age. These estimates from a linear regression model do not indicate a timing difference by age in the propensity to stockpile. In both weeks, age has a negative effect on the amount stockpiled, at comparable levels. The subsequent section shows that there are indeed timing differences between different age groups, using a more flexible age specification that allows nonlinear effects.

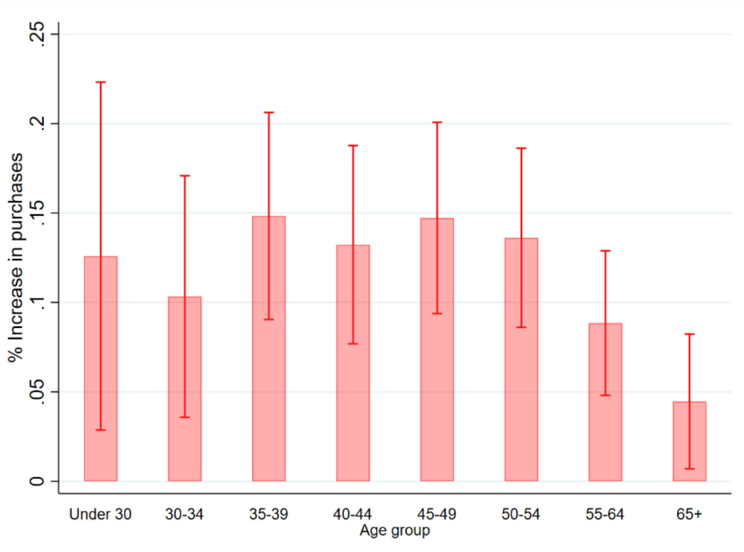
Rows 9 and 10 show interactions with income. These estimates suggest a significantly larger effect for the first week, suggesting that higher-income households are not only more likely to stockpile larger quantities, but also more likely to buy in advance, during the earlier stages of panic buying.

The same front-loaded pattern in timing is observed for larger households. In fact, the positive effect of household size on panic buying is statistically significant only for the earlier phase and twice as large in magnitude. A plausible explanation for heads of large households acting early could be higher risk aversion that comes with taking responsibility for more dependents. Finally, the results in this specification confirm that higher education has no effect on panic buying behavior.

Effects on different income and age groups

The main regression model presented above assumes linear effects of demographic effects on the propensity to stockpile. To analyze the differential effects for different population groups, this section reports the effects for different income and age levels, controlling for other demographic variables. These estimates are obtained using modified versions of Equation 1, where income is represented by a categorical variable indicating the income quintile of the household according to upper thresholds for the quintiles as taken from the U.S. Census (Figure 2) and age is represented by a categorical variable indicating the age group of the household head as provided in the Nielsen data (Figure 3). These categorical variables are interacted with the dummy indicating the panic period to obtain the plotted estimates. In Figures 4 and 5 the two weeks within the panic period are accounted for separately, using separate dummy variables.

Figure 3: Stockpiling by age group



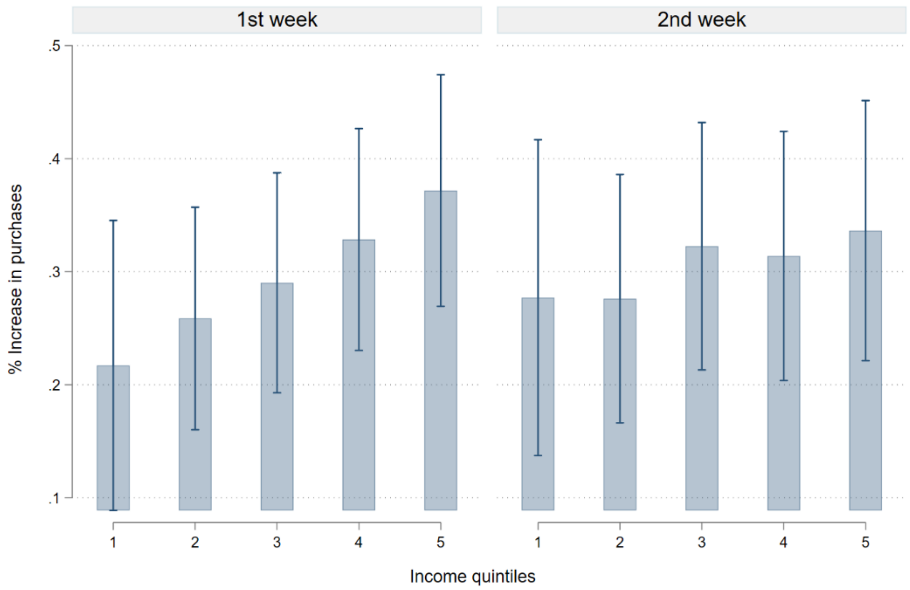
Note: Capped lines indicate the %95 confidence intervals.

Figure 2 reveals distinct variations in stockpiling levels across income groups. The plotted data exhibits a consistent rise in the quantity of dry groceries purchased with each income quintile. Notably, the lowest quintile demonstrates a 25% increase in purchases, while the middle quintile shows a 30% increase. Conversely, the highest income group exhibits the most substantial increase, reaching approximately 35%. These findings underscore the pivotal role of financial circumstances in determining the extent to which households can stockpile.

Figure 3 presents the stockpile patterns across various age groups. The estimates indicate that older households, aged 55 and above, accumulate smaller inventories compared to other groups. For households aged 55-64, the accumulated inventories amount to approximately 8% of their usual purchase quantities, whereas households aged 65 and older show less than 5% accumulation.

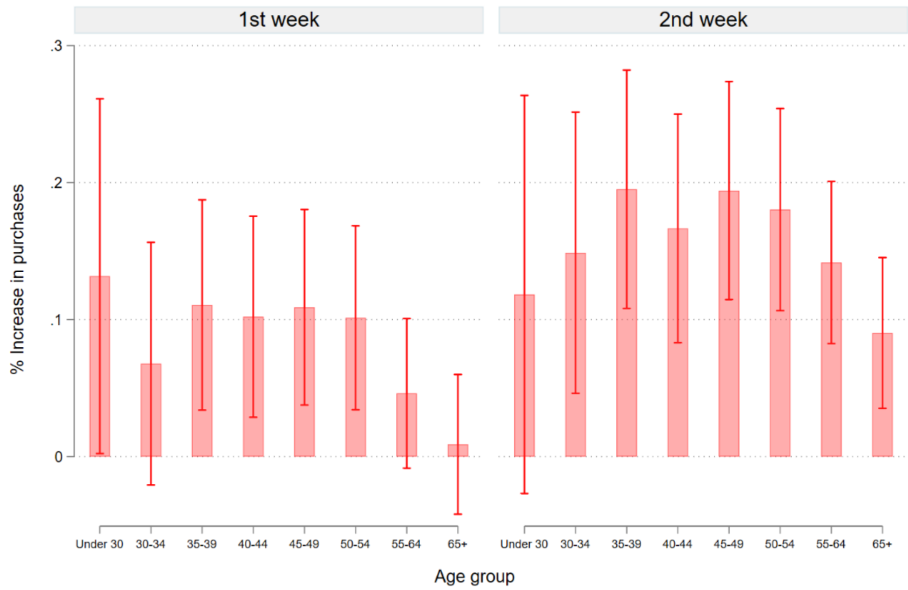
Figures 4 and 5 analyze these effects during the first and second halves of the panic period while allowing for variations. In terms of income, the effects show similar magnitudes for households across different income levels during the later phase of panic buying. However, significant differences arise between the groups during the earlier phase. For the lowest income group, stockpiling is concentrated towards the later weeks, indicating relatively lower amounts stockpiled in the earlier weeks. Conversely, the highest income group exhibits the opposite trend. Consequently, it appears that low-income households' stockpiling efforts catch up with higher income groups only later, and even then, at comparatively lower rates.

Figure 4: Timing of stockpiling by income level



Note: Capped lines indicate the %95 confidence intervals.

Figure 5: Timing of stockpiling by age group



Note: Capped lines indicate the %95 confidence intervals.

Estimates across age groups reveal even more pronounced variations in the pace of inventory buildup. When comparing relative purchases in the first and second weeks by age group, it becomes evident that younger households, under the age of 30, tend to make their purchases early on. On the other hand, purchase rates for all older age groups are more concentrated towards the later stage of the panic buying period.

One particularly notable observation stemming from this analysis is that the older population exhibits no stockpiling activity during the first week. In fact, for the most vulnerable group of households aged 65 and older, no inventory buildup is observed during the initial phase of the panic buying period.

CONCLUSION

This paper examines household stockpiling behavior for necessities in response to an anticipated supply crisis, based on the empirical example of the COVID -19 pandemic. The results indicate a significant increase in purchases of dry staple foods in the period immediately following the declaration of the coronoavirus outbreak as a pandemic, amounting to 20% of regular purchase amounts. Findings highlight substantial differences with respect to age and income in how much inventory households accumulate, especially in the early phase of the panic period. Controlling for other demographic factors, the results indicate a difference of approximately 15% in stockpiling rates of the poorest and richest income groups.

With respect to age, the difference is even more dramatic: households over 65 seem to have been unable to build any stocks at all in the early stage. These results seem even more critical when it is considered that income levels should not have a large impact on the demand for necessities and that, all else being equal, it is important for older households to build sufficient stocks to avoid going out in risk of contracting the disease (Amaral et al., 2022).

While it is not possible to determine the optimal level of stocks that each household should hold, the marked differences in stockpiling rates by age and income suggest that financial, time, and information constraints may play a role in the lagged, weaker demand response from the poor and the elderly. Poorer households may not have sufficient resources to purchase adequate quantities of the product in advance. In addition, blue-collar jobs generally may not provide poor households with the time flexibility to do their purchases in a timely manner before supplies run out. Similarly, older people may not act quickly in the event of a crisis. More generally, there may be information barriers as a result of which these population groups are late to learn about the pandemic and the precautions to take.

Addressing the challenges related to the inequitable distribution of essential supplies during emergencies requires careful consideration and the implementation of targeted strategies. One approach may be to focus on ensuring that vulnerable populations have sufficient access to essential products during times of need. Supermarkets can play a crucial role in this regard by exploring options such as special quotas for specific product groups or allocating dedicated time slots for these individuals to shop. These measures can help prioritize the needs of vulnerable consumers and create a more inclusive shopping environment.

Governments and public agencies also have a responsibility to support families facing financial constraints. Providing monetary or in-kind assistance can help alleviate the financial burdens that may prevent vulnerable households from acquiring necessary supplies. By ensuring that financial constraints do not become a barrier, governments can contribute to a more equitable distribution of resources during emergencies.

Additionally, addressing information deficits is vital for empowering all segments of the population to make informed decisions and take necessary precautions. Collaborative efforts between governments and the media can help bridge this gap by disseminating accurate and timely information about the emergency situation, preventive measures, and available resources. This can empower individuals, especially vulnerable groups, to take appropriate actions and protect themselves effectively.

There are several avenues for future research that can contribute to a deeper understanding of household stockpiling behavior during supply crises. Investigating the influence of cultural and social factors on stockpiling patterns would provide valuable insights into the underlying motivations and decision-making processes of different demographic groups. Understanding how cultural norms, social networks, and community dynamics shape stockpiling behavior can help tailor interventions and communication strategies to better address the needs of diverse populations. In addition, exploring the long-term effects of stockpiling behavior on individuals and communities would be valuable. Understanding how stockpiling impacts economic dynamics, social inequalities, and the resilience of supply chains can help policymakers develop strategies to mitigate potential negative consequences during future crises.

AUTHOR STATEMENT

Araştırmacı(lar) makaleye ortak olarak katkıda bulunduğunu bildirmiştir. Araştırmacılar herhangi bir çıkar çatışması bildirmemiştir.

Researchers have jointly contributed to the article. Researchers have not declared any conflict of interest.

REFERENCES

Ahmadi, I., Habel, J., Jia, M., Lee, N., & Wei, S. (2022). Consumer stockpiling across cultures during the COVID-19 pandemic. *Journal of International Marketing*, *30*(2), 28-37.

Amaral, N. B., Chang, B., & Burns, R. (2022). Understanding consumer stockpiling: Insights provided during the COVID-19 pandemic. *Journal of Consumer Affairs*, *56*(1), 211-236.

Arafat, S. Y., Kar, S. K., Marthoenis, M., Sharma, P., Apu, E. H., & Kabir, R. (2020). Psychological underpinning of panic buying during pandemic (COVID-19). *Psychiatry Research*, *289*.

Billore, S., & Anisimova, T. (2021). Panic buying research: A systematic literature review and future research agenda. *International Journal of Consumer Studies*, *45*(4), 777-804.

Bucklin, R. E., Gupta, S., & Han, S. (1995). A brand's eye view of response segmentation in consumer brand choice behavior. *Journal of Marketing Research*, *32*(1), 66-74.

Chen, Y., Rajabifard, A., Sabri, S., Potts, K. E., Laylavi, F., Xie, Y., & Zhang, Y. (2020). A discussion of irrational stockpiling behaviour during crisis. *Journal of Safety Science and Resilience*, *1*(1), 57-58.

Ching, A. T., & Osborne, M. (2020). Identification and estimation of forward-looking behavior: The case of consumer stockpiling. *Marketing Science*, *39*(4), 707-726.

Cruz-Cárdenas, J., Zabelina, E., Guadalupe-Lanas, J., Palacio-Fierro, A., & Ramos-Galarza, C. (2021). COVID-19, consumer behavior, technology, and society: A literature review and bibliometric analysis. *Technological forecasting and social change*, *173*, 121179.

Dammeyer, J. (2020). An explorative study of the individual differences associated with consumer stockpiling during the early stages of the 2020 Coronavirus outbreak in Europe. *Personality and Individual Differences*, *167*, 110263.

Dong, X., & Klaiber, H. A. (2019). Consumer stockpiling in response to the US EISA “light bulb ban”. *Energy Economics*, *81*, 566-576.

Gupta, S. (1991). Stochastic models of ınterpurchase time with time-dependent covariates. *Journal of Marketing Research*, *28*(1), 1–15.

Gupta, R., Nair, K., & Radhakrishnan, L. (2021). Impact of COVID-19 crisis on stocking and impulse buying behaviour of consumers. *International Journal of Social Economics*, *48*(12), 1794-1809.

Hill, R. P., & Sharma, E. (2020). Consumer vulnerability. *Journal of Consumer Psychology*, *30*(3), 551-570.

Hori, M., & Iwamoto, K. (2014). The run-on daily foods and goods after the 2011 Tohoku earthquake: a fact finding analysis based on homescan data. *The Japanese Political Economy*, *40*(1), 69-113.

Ishida, T., Maruyama, A., & Kurihara, S. (2013). Consumer reaction to the great east Japan earthquake. *Journal of Life Sciences*, *7*(8), 883.

Kulemeka, O. (2010). US consumers and disaster: Observing “panic buying” during the winter storm and hurricane seasons. *ACR North American Advances*.

McKinnon, G., Smith, M. E., & Keith Hunt, H. (1985). Hoarding behavior among consumers: Conceptualization and marketing implications. *Journal of the Academy of Marketing Science, 13*(1-2), 340-351.

Mela, C. F., Jedidi, K., & Bowman, D. (1998). The long-term impact of promotions on consumer stockpiling behavior. *Journal of Marketing research*, *35*(2), 250-262.

Meyer, R. J., & Assuncao, J. (1990). The optimality of consumer stockpiling strategies. *Marketing Science*, *9*(1), 18-41.

Micalizzi, L., Zambrotta, N. S., & Bernstein, M. H. (2021). Stockpiling in the time of COVID-19. *British journal of health psychology*, *26*(2), 535-543.

Naeem, M. (2021). Do social media platforms develop consumer panic buying during the fear of Covid-19 pandemic. *Journal of Retailing and Consumer Services, 58,* 102226.

Pan, X., Dresner, M., Mantin, B., & Zhang, J. A. (2020). Pre-hurricane consumer stockpiling and post-hurricane product availability: Empirical evidence from natural experiments. *Production and Operations Management*, *29*(10), 2350-2380.

Papagiannidis, S., Alamanos, E., Bourlakis, M., & Dennis, C. (2022). The pandemic consumer response: a stockpiling perspective and shopping channel preferences. *British Journal of Management*.

Prentice, C., Chen, J., & Stantic, B. (2020). Timed intervention in COVID-19 and panic buying. *Journal of Retailing and Consumer Services*, *57*, 102203.

Prentice, C., Quach, S., & Thaichon, P. (2022). Antecedents and consequences of panic buying: The case of COVID-19. *International Journal of Consumer Studies*, *46*(1), 132-146.

Sadus, K., Göttmann, J., & Schubert, A. L. (2022). Predictors of stockpiling behavior during the COVID-19 pandemic in Germany. *Journal of Public Health*, 1-17.

Singh, G., Slack, N. J., Sharma, S., & Dhir, A. (2023). Stockpiling intentions and customer well-being during the COVID-19 pandemic. *Journal of Consumer Affairs,* (SI), 1-27.

Sterman, J. D., & Dogan, G. (2015). "I'm not hoarding, i'm just stocking up before the hoarders get here.": Behavioral causes of phantom ordering in supply chains. *Journal of Operations Management*, *39*, 6-22.

Wang, E., An, N., Gao, Z., Kiprop, E., & Geng, X. (2020). Consumer food stockpiling behavior and willingness to pay for food reserves in COVID-19. *Food Security*, *12*(4), 739-747.

Yuen, K. F., Wang, X., Ma, F., & Li, K. X. (2020). The psychological causes of panic buying following a health crisis. *International journal of environmental research and public health*, *17*(10), 3513.

Zhang, Y., & Zhou, R. (2021). Promoting social distancing and preventing panic buying during the epidemic of COVID-19: The contributions of people's psychological and behavioural factors. *Journal of Public Health,* 31, 1-15.