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Did the COVID-19 pandemic permanently impact e-commerce in the US market?

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Abstract: The pandemic compelled many individuals, initially hesitant about online shopping, to overcome their reservations, acquire essential skills, and transition to online retail. This provided a natural experiment to assess whether the barriers to online shopping and the comfort of traditional in-store habits have hindered a broader shift to e-commerce. This paper uses the US retail data to analyze e-commerce activities before, during, and after the pandemic to determine whether the pandemic has permanently altered by utilizing structural break detection tools. Additionally, we carry out a forecasting exercise for post-pandemic based on pre-pandemic data to confirm our findings. Results suggest that while e-commerce activities surged during lockdown, they have predominantly reverted to pre-pandemic patterns. Our findings caution both investors and companies against overreaction in the face of exuberant changes in the market to avoid painful corrections afterward.

Keywords: Technological change; Habit formation; Learning by doing; COVID; Revolving ADF

JEL classifications: G41, O33, C22, O14, D12

1. Introduction

The literature extensively examines how technology has impacted human behavior and business practices, particularly in terms of whether individuals stick to old habits or develop new ones using technology and acquiring new skills. The COVID-19 pandemic has provided a unique opportunity to investigate whether people will continue shopping online after overcoming technological barriers and learning new skills or revert to their previous habit of shopping in-store. This paper aims to determine if COVID-19 has permanently changed people's traditional shopping behavior, usually in physical stores, to online shopping platforms, disrupting any previous habits. More specifically, this study aims to examine whether there has been a noticeable shift in the pattern of online shopping, which has come at the expense of physical store shopping, and whether this represents a structural break in e-commerce in the USA during a period that includes the COVID-19 crisis.

To achieve our goal, we examine the consumers' e-commerce activities before, during, and after the pandemic to determine whether the pandemic has permanently altered the pattern of the activities. To this end, we analyze the statistical characteristics of e-commerce-related indicators in the USA, especially in search of a structural break, which should be expected if the shopping behavior of consumers has significantly changed in the post-pandemic period compared to the pre-pandemic period. In anticipation of our findings, we can say that our results indicate that even though e-commerce activities significantly increased and deviated from the pre-pandemic pattern during the lockdown period, e-commerce has mostly returned to its pre-pandemic trend. In other words, we

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do not observe a habit change in consumers' online shopping attitudes due to a crisis such as COVID-19.

Our findings have practical implications. There was a euphoria, expressed especially in media, in anticipation of a drastic change in consumer behavior following the pandemic. "Pundits" recommended that companies should immediately shift to online markets; otherwise, they would face an eventual irrelevance. Likewise, there were also very hopeful predictions about the stock market performance of e-commerce companies. Nevertheless, via our findings, while we acknowledge the importance of recognizing the place of online shopping in the future of our economy, we caution both investors and companies against overreaction in the face of exuberant changes in the market to avoid painful corrections afterward.

Furthermore, as we mention below in the literature review section, we contribute to the literature by studying consumer behavior with ramifications on the corporate world and stock market where the literature is inconclusive (Ammari et al., 2023). We show that the anticipated shock to consumer behavior was only temporary but not permanent. That is probably the reason why many linear models arrive at different conclusions. In that sense, we agree with Ammari et al. (2023). However, our contributions are not necessarily limited to the implications for the stock market but the wider corporate world.

The rest of the paper is as follows. Section 2 discusses the relevant literature. Section 3 introduces the data and relevant econometric methods used in the study after formulating the variable of concern to measure online shopping. In Section 4, the econometric analysis is presented, and the results are discussed in Section 5. Finally, Section 6 concludes the paper.

2. Literature Review

Although the "digitalization/e-commercialization" of business has been around for a while, the size of e-commerce activities compared with the in-store (brick and mortar) sales and GDP was deemed to be too "small" to be explicitly included in certain government statistics in the pre-COVID era (Isaac, 2018; Wadhwani, 2000). That might explain why several studies have failed to find a strong "Amazon effect" on prices (Ciccarelli & Osbat, 2017; Charbonneau et al., 2017; Hatzius et al., 2017; Genc, 2021). Parenthetically, the Amazon effect refers to the role of the company Amazon in leading pricing decisions in the US retail business. The Amazon effect is closely related to the pervasiveness of online shopping activities. Recently, Genc (2021) showed that the Amazon effect in the US was not substantial in the pre-COVID era. The low volume of online sales during the pre-pandemic years was credited with yielding that result. However, the share of online sales was predicted to increase significantly due to COVID-19 (Del Rey, 2020) since COVID-19 pushed everybody to stay home and forced them to rely on online shopping. In other words, COVID-19 has led to far-reaching changes in consumers' everyday lives, including their shopping habits (Blundell et al., 2020). Statistically, such a shift in behavior is considered a structural break in digital marketplace trends caused by the pandemic (Kim, 2020). The reason is that by forcing people to shop online, the pandemic has compelled consumers to "learn" new skills to be able to do online shopping. Those skills were long regarded as an impediment to digital experience (Peres et al., 2010). Consumers likely retain some of the newly acquired technology-based shopping habits they learned during the lockdowns. In other words, COVID-19 provided a natural experiment at an unprecedented scale by exogenously forcing people to adopt new habits.

It is also expected that firms will accommodate the change in consumer behavior (Rangaswami & Gupta, 2000; Wolfinbarger & Gilly, 2001; Lin & Lekhawipat, 2014; Sheth, 2020). As a matter of fact, research shows that firms took the COVID-19 shock seriously and responded in a number of ways (Klockner et al., 2023). COVID-19 accelerated the digitalization of businesses. Although digitalization is seen as positive, it also comes with some risks (Amankwah-Amoah et al., 2021). All these point to an ever-expanding digital market exacerbated by COVID-19.

Unsurprisingly, the role of Amazon (and similar companies) in online shopping was significantly enhanced in the pandemic era. The fact that Amazon kept hiring while many other companies shed labor is another sign of the company's healthy growth with a strong hold on the digital marketplace (Del Rey, 2020). The question is whether the story of Amazon really signals a more widespread and speedier e-commerce orientation of the retail business. If proven true, such a change in shopping behavior would have dramatic consequences for consumers and, perhaps more so, for businesses.

It is probably too simplistic to see "shopping" as a mere means to satisfy only physical needs. Shopping is an "experience" with many aspects, such as social, relational, and individual perspectives (Kim et al., 2013). Although collaborative online shopping may have retained some of these aspects, it has not replaced the in-store counterparts on all of them. On the other hand, this expectation of drastic change in shopping behavior reminds us of the much anticipated and advertised, but never fully materialized, "cash-less society" argument of the 1970s if the anticipated shopping behavioral shift fails to materialize.

The mood of those participating in financial markets is considered to be one of the most influential factors in determining investor decision-making, where the mood is a confluence of economic and non-economic information (Nofsinger, 2005) including investors' behavioral biases such as herding behavior, loss aversion, mental accounting, and overconfidence. The mood may have an oversized impact on investors' decisions leading to "irrational" outcomes in the stock market (Black, 1986; Odean, 1998; Loewenstein et al., 2001; Baker & Stein, 2004). COVID-19 was an example of mood-altering news for stock markets with considerable effects around the world (Zaremba et al., 2021).

The impact of COVID-19-related stress is not confined to markets. As a matter of fact, financial stress, which may be exacerbated at times of crises such as a pandemic, may also have significant effects on personal and family relationships (Kelley et al., 2023). Naturally, the pandemic affected everybody at the personal levels in the world irrespective of their personal and socio-economic characteristics such as age, gender, income, and educational attainment. Yet, the impact was not necessarily identical across these characteristics (Ketan et al., 2022). Also, the impact is felt differently in different geographic regions. To illustrate, the US regions with high financial distress seem to suffer more from the COVID-19 pandemic than other regions as they had a more difficult time weathering financial distress (Athreya et al., 2021). Authors define financial distress as a preexisting condition.

However, the precise identification and permanency of the aforementioned impact is still disputed. Ammari et al. (2023) state that the recent literature remains inconclusive regarding the effect of COVID-19 information and investor sentiment on financial markets. Likewise, survey data conducted early in the post-pandemic period cast doubt on the perception of permanency of the pandemic. According to a Pew survey, about half of non-retired American adults do not think that the pandemic will have any significant impact on their long-term financial goals. Only 21 percent of these individuals or their families reported worse financial situations in 2021 compared to a year ago (Pew Research Center, 2021).

Consumer behavior would have direct (or indirect) effects on the corporate world in terms of supply, finances, and the markets. Ultimately, it is an empirical question whether there is a structural change in consumer shopping behavior because of a natural shock that forced people to learn certain technical skills and overcome barriers to online shopping.

3. Data and Methods

We collect data on several e-commerce-related indicators and relevant variables from the FRED site of the St Louis Federal Reserve. The variables, which are seasonally adjusted and have monthly frequency, are shown below:

- *RSNSR*: Advance retail sales by non-store retailers;

- $RSFSXMV$: Advance retail sales, including food services but excluding motor vehicle and parts dealers;
- $RSFSDP$: Advance retail sales for food services and drinking places;
- $RSDBS$: Advance retail sales by food and beverage stores.

Finally, we adopt the definition of online retail sales compared to all other non-food, non-motor vehicle retail sales, $retail$, as suggested by Mendez-Carbajo (2022), which is shown below.

$$leretail = log\ (100 \times \frac{RSNSR}{RSFSXMV - RSFSDP - RSDBS}) \quad (1)$$

The data span is from January 1992 (1992m1) for variables with available observations until September 2022 (2022m9).[1]

Our research methods are a combination of structural break detection analyses. We aim to identify if there is a statistically significant change in the e-commerce variable ($leretail$) defined above in the aftermath of the pandemic. We employ both traditional and more recently developed econometric methods to search for such a shift in data. Additionally, we analyze the statistical properties of the first difference of our variable of concern. Economically, this is equivalent to the growth rate of the e-commerce activities considered in this paper. As is well known in the literature, a finding of a structural break is not a guarantee for an increase in the level of the variable of concern. In other words, if the consumers have retained some of their newly learned skills, which were acquired during the pandemic, the forecast of our variable of concern based on the pre-pandemic period should underpredict the post-pandemic period. To entertain that possibility, we also undertake a forecasting exercise in the econometric section of our paper. As for the econometric methods used, other than the traditional unit root tests such as ADF and KPSS, we employ the recently developed bubble detection strategies à la Phillips and Yu (2011), Phillips, Wu and Yu (2011), and Phillips Shi and Yu (2015). This is a right-tailed rolling ADF test to detect the likely explosive behavior in data. As a way of confirming our analysis, we also conduct the Genc-Arzaghi (2011) test on the first difference of $leretail$ to see the conceivable structural break in data. Moreover, as a further check, as stated above, we carry out a forecasting exercise with the pre-COVID period as the basis and the post-COVID period as the forecast period.

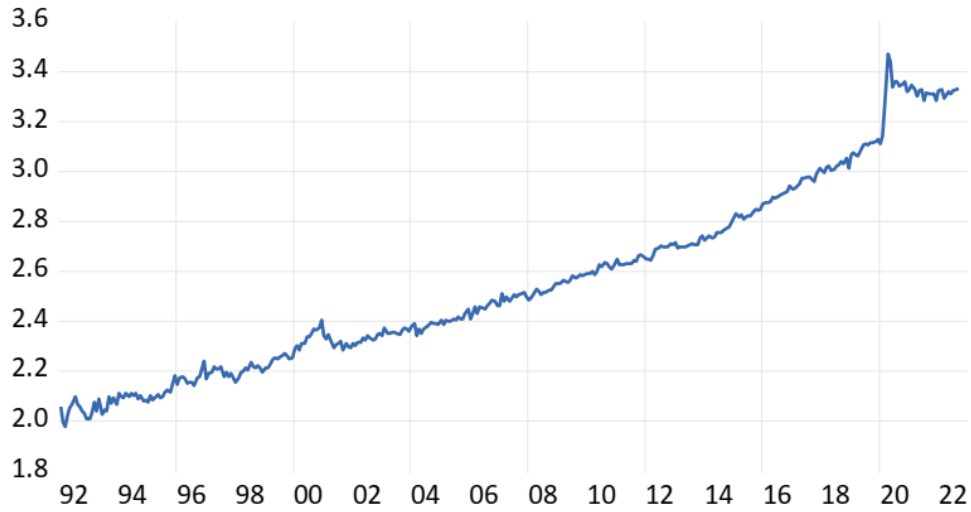
4. Econometric Analysis

Figure 1 shows the time series graph of the e-commerce variable. It seems that e-commerce has increased over time relative to all retail sales. It peaked during the COVID episode starting with the first month of 2020. However, the immediate drastic increase was short-lived and quickly declined back in 2020m4-2020m6 toward its long-run trend. The new path seems to converge asymptotically to the long-run trend in the pre-COVID era. Thus, the e-commerce surge during the pandemic is not sustained with a permanent upward trajectory. We can conjecture that consumers have returned to their old shopping habits, i.e., online versus brick-and-mortar, following the end of the pandemic. In other words, people seem not to have easily forgotten their pre-pandemic shopping behavior but rather have paused them due to force majeure. Alternatively, people return to, and stick with, their usual shopping habits due to the behavior which was formed before but paused for a brief reprieve. Hence, based on a visual inspection of the e-commerce data, we can say that habit formation is a strong trait of shoppers, much more powerful than learning 'skills' by doing. On a related note, we can say that the technical barriers to online shopping are less of an impediment than previously thought. This is because consumers and firms adapted to the new living and doing business conditions and migrated to the

[1] Additionally, we collect data on ecommerce retail sales (ECOMSA), and the same concept as a percentage of total sales (ECOMPCTSA). The former is deflated by the gross domestic product (GDP), $ECOGDP = ECOMSA\ GDP$. These data are quarterly, and the results obtained from these variables qualitatively mimic the findings of the monthly data.

online environment by quickly acquiring the necessary new skills. Nevertheless, habits and preferences generally seem to play more decisive roles in the long run, especially, when the initial impact (confusion and threat) of a shock subsides.

Figure 1. E-commerce in the USA. The vertical axis represents the natural log of the ecommerce variable defined in the main body of the text.



In what follows, we concentrate on *leretail* for the econometric analysis of ecommerce in the USA by formally testing the time series characteristics of *leretail*. The traditional unit root tests, such as ADF and KPSS results, are shown in Table 1, indicating that *leretail* is nonstationary.

Table 1. Traditional Unit Root Tests

	Type	Level/FD	H0	H1	C/T	LL/BW/Win	Rep	Calc	5% CV
LERETAIL	ADF	Level	I(1)	I(0)	C, T	0		-2.4485	-3.4221
		FD			C	1		-16.73	-2.8692
	KPSS	Level	I(0)	I(1)	C, T	15		0.47236	0.146
		FD			C	28		0.39882	0.463
	RADF	Level	I(1)	Bubbles	C	36	200	3.638254	-0.01604

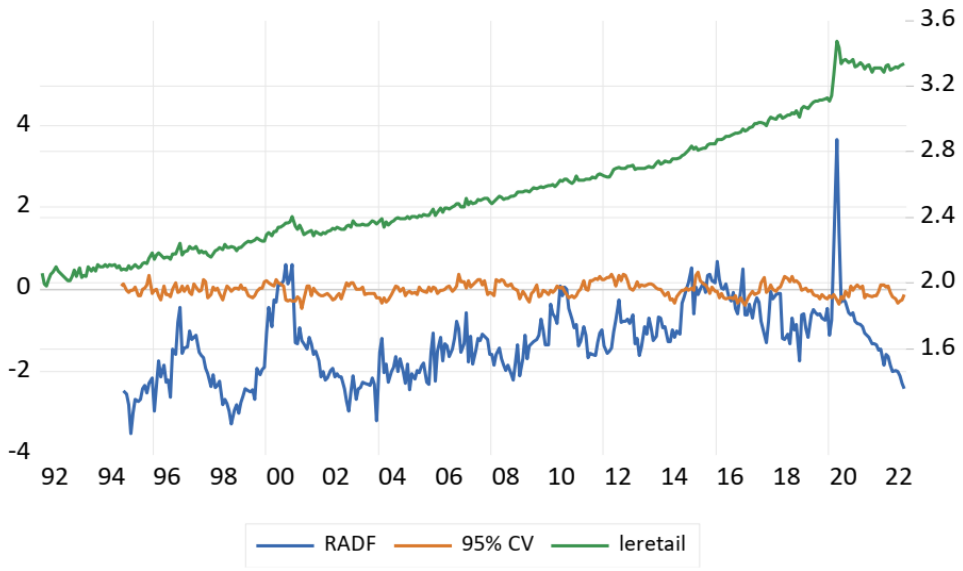
Sample: 1992m1-2022m9. Optimal lag length where appropriate is determined by SIC. The KPSS bandwidth is determined with Newey-West automatic using Bartlett kernel. Exogenous variables are a constant and time trend. RADF Window size is 36.

However, the non-stationarity of financial and economic data may signal explosive behavior emerging in specific periods. Because not all explosive behavior converts to a long-run trend, some occurrences could be just a relatively short-lived bubble. Recently, Phillips and Yu (2011), Phillips, Wu and Yu (2011), and Phillips, Shi, and Yu (2015) have developed new versions of the traditional stationarity tests, which make a distinction between the unit root (non-stationarity) of the data versus a bubble. The test equation is based on the following specification:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta y_{t-j} + \varepsilon_t \quad (2)$$

where the null hypothesis is that $\beta 1 = 1$, i.e., the unit root, vs $\beta 1 > 1$, i.e., the mildly explosive unit root coefficient. Caspi (2017) and Baum and Otero (2021) provide detailed discussions and applications of these tests. The test results of *leretail* are shown in Table 1 via RADF tests as well in Figure 2

Figure 2. Rolling ADF Tests



The RADF test determines a few dates where the behavior of *leretail* may be deemed bubbly such as 2000m6-2001m1, 2015m8-2017m2, and 2020m3-2020m6. The first subperiod, i.e., 2000m6-2001m1, must reflect the jitters of the dot-com bubble. The second subperiod, i.e., 2015m8-2017m2, could be related to international concerns regarding the unanticipated official depreciation of the Chinese Yuan in August 2015[2], Brexit, and the US presidential elections in 2016[3] Our main interest, however, is the last subperiod, namely, 2020m3-2020m6. This is the early period of the spread of the pandemic worldwide with deadly consequences. Naturally, the US public also went online to shop in response to restrictions imposed by authorities. However, we also observe that the explosive behavior disappeared by midyear in 2020.

Finally, we present the results of the Genc-Arzaghi (2011) test for a structural break in Figure 3. This test finds a structural break in the growth rate of *leretail* corresponding to 2020m4-2020m7. These dates are very similar to the bubbles found via RADF tests above.

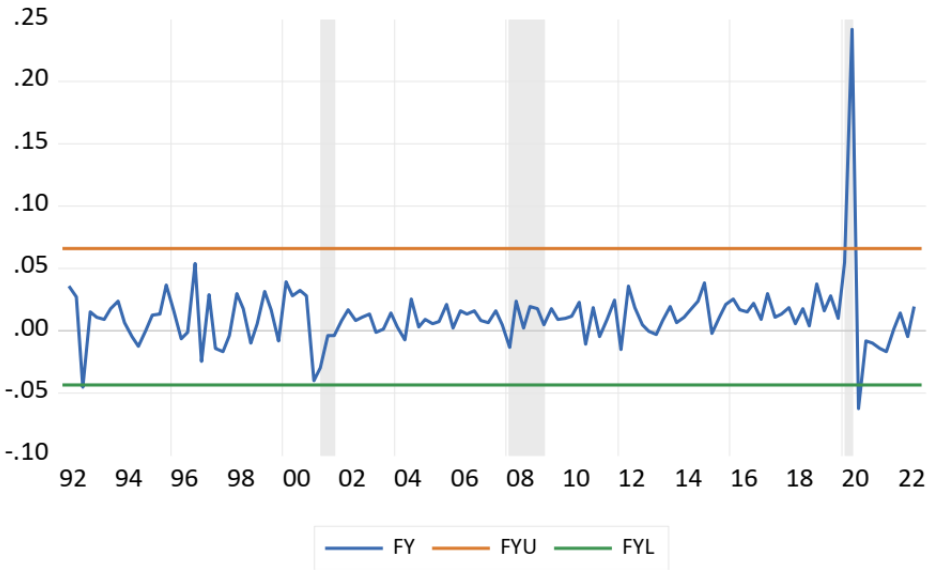
5. Discussion of Results

We think our findings can be explained by two contending theories: Habit formation vs learning by doing. The former presumes that once people acquire particular skills and practice them for a substantially long time, they tend to retain them without resorting to discovering new (and perhaps more beneficial) ways to conduct their business as the discovery and learning require employing extra resources. In other words, after the initial cost invested in the learning process to acquire a certain skill, habit formation requires no additional resource sacrifice to handle the "usual" business. Conversely, the latter (learning by doing), although possibly promising more rewards, entails a persistent effort to acquire new knowledge to do business (Verplanken & Whitmarsh, 2021).[4] In economic terms, habitual behavior only involves a "fixed cost" of acquiring the skill. Even though

[2] https://www.cfr.org/blog/ten-most-significant-world-events-2015 Accessed 11/1/2022.
[3] https://www.cfr.org/blog/ten-most-significant-world-events-2016 Accessed 11/1/2022
[4] Arrow (1962) provides a lucid discussion of learning by doing within the context of economic growth.

habitual behavior is not flexible and prospective (Gardner et al., 2014), it is familiar, automatic, and time-tested regarding its efficacy in delivering results (Verplanken & Aarts, 1999; Carden & Wood, 2018). This is not surprising as humans tend to lean toward familiar territory in conducting business. In this sense, Barnes et al. (2005) and Smith and Graybiel (2016) provide a biological explanation and possible ways of behavior alteration via certain functions of the brain. It is also consistent with the economic theory, where an agent drives utility not just from the current level of activity but also from its past levels (Alvarez-Cuadrado et al., 2004). This translates to consideration of the switching costs from a familiar activity to something new, which amounts to a behavioral change (Klemperer, 1995).[5]

Figure 3. Genc-Arzaghi test result with NBER determined recession dates.



As opposed to the fixed cost of habit formation, learning by doing involves practice and development of observations of "things" around, resulting in an ever-accumulating "variable cost," At least at the initial stages of the learning process. As such, it requires active participation in the learning exercise on the part of an individual to be able to develop new skills. In other words, learning by doing is "costlier" compared to habit formation. Additionally, there is a chance that all the efforts put forth to learn a new skill may bring forth no additional benefit or even an extra loss. Therefore, learning by doing carries a risk factor vis-à-vis the safe route of doing what one already knows (old habits). Furthermore, despite the widespread assumptions in the literature, learning is not necessarily unbounded (Thompson, 2008), thus injecting additional possibility of an unrewarding burden associated with learning by doing. Conversely, if one undertakes the learning efforts, accepting the possibility of failure, learning by doing may bring about decreasing average cost as producing (conducting an activity) a large cumulative quantity of the output. Yet, as alluded to above, the outcome is not certain.

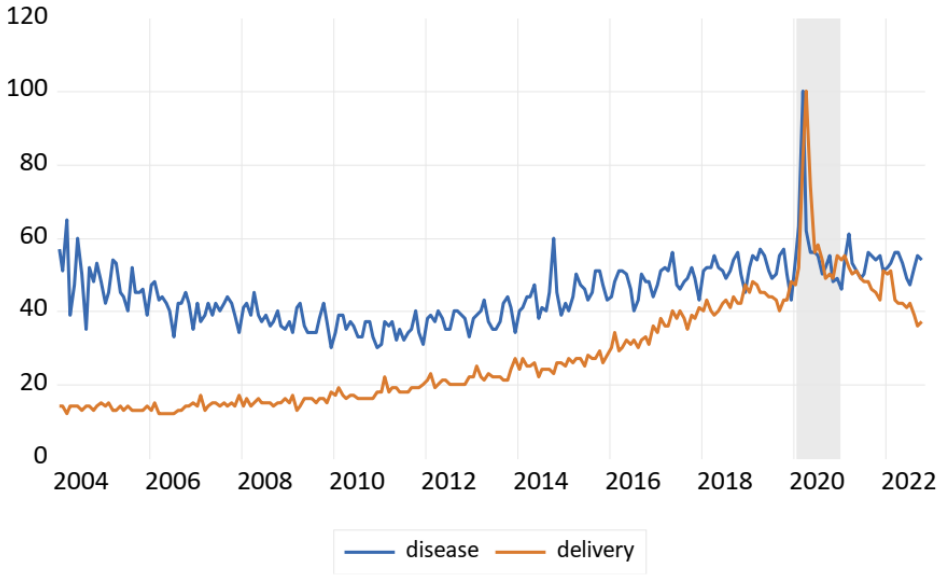
According to the theory of the discontinuity effect, if people find themselves in changed environments/conditions, they acquiesce to adopting new ways of conducting business, especially when they are "clueless" about the new environment (Walker et al., 2015). COVID-19 presented a virtually new environment in the extreme (force majeure) unparalleled in the personal experience of anybody alive during the pandemic era. Just when people needed new ways of doing business, technology came to the rescue as it was

[5] In a broader sense, inducing a social change, even if it is more beneficial compared to the current practice, is difficult (Kurz et al., 2015; Verplanken & Roy, 2016; Michalek et al., 2019).

known to induce more habit changes (Carden & Wood, 2018). Almost anybody has access to mobile devices such as smartphones and tablet computers, which are known to have helped people develop more complicated shopping experiences (Spaid & Flint, 2014).

The aforementioned observation that online sales were small relative to all sales in the pre-COVID era was based on the presumption that shoppers were technology illiterate. But people learn new skills as they go (do the business continually). COVID-19 provided that opportunity for people to practice e-commerce even if they did not want to. The expectation was that people would overcome the technological barriers, learn how to shop online and get hooked. They would learn as they practiced shopping daily (learning by doing). Eventually, they would retain the acquired knowledge of IT-related shopping. Also, firms would concur (Rangaswami & Gupta, 2000; Wolfinbarger & Gilly, 2001; Peres et al., 2010; Lin & Lekhawipat, 2014; Sheth, 2020). However, our visual as well as econometric analyses show that that is not necessarily the case.

Figure 4: Uncertainty indicators. The shaded area shows the pandemic era. "disease" and "delivery" refer to Google searches for disease and delivery in the USA, respectively.



In explaining the contradiction between the aforementioned theoretical expectations in the literature and our empirical findings, we start by observing that, generally speaking, interventions to promote a healthy lifestyle have met only short-term success (Wood & Neal, 2016). Economic theory suggests that people resist the change in consumption behavior even when faced with unfortunate times such as severe declines in income (Campbell & Deaton, 1989; Carroll & Weil, 1994; Abel, 1990; Constantinides, 1990; Ferson & Constantinides, 1991; Campbell & Cochrane, 1999).[6] Thus, we conjecture that the transitory jump in online shopping during the COVID-19 era is probably the involuntary outcome of a natural event that temporarily forced a change in shopper behavior. But as soon as people have gotten used to the new environment, and especially when they feel safe vis-à- vis the environment around them, they return to their old ways. In support of this conjecture, we show the Google searches for "disease" and "delivery" in Figure 4. We observe in Figure 4 that the nervousness about the pandemic (disease) dissipated after an initial spike in efforts to find answers to questions regarding the pandemic. Likewise, the same is true about internet searches regarding deliveries (delivery) in the US. Both indicators may also be interpreted as the accumulated knowledge about the new circumstances imposed by the pandemic but combined with relaxing pandemic-induced restrictions in the

[6] However, Dynan (2000) argues that there is no evidence of the existence of household consumption habit formation.

US. Therefore, we infer that this is some evidence of habit formation, i.e., people going back to their "normal" (old) ways after an involuntary and freedom-restrictive experience.

Our findings also highlight the case of incorrect expectations on the permanence of COVID-19's effects on e-commerce and stock over-valuation. The mistaken anticipation of the long-term impacts of COVID-19 on the e-commerce sector has resulted in a pronounced issue of overvaluation within the financial markets. This is the notion of exuberance (bubbles) in financial markets. This has particularly affected e-commerce giants like Amazon and tech companies like Zoom. The valuation of these stocks skyrocketed far beyond what would be considered rational according to the efficient market hypothesis. This soaring valuation was largely driven by the unwavering belief that the transformation brought about by the pandemic was irreversible.

Take, for example, Amazon. Figure 5 shows the ratio of the adjusted closing prices of Amazon with respect to such market average valuations as DJIA (ad) and SP500 (as).[7] We disaggregate the aforementioned ratios to their historical trends and cycles via the Hodrick-Prescott (HP) filter. Then, we graph the said ratio and its trend. There is a striking similarity in the shapes of both ratios. Through this figure, we observe that starting around the beginning of the pandemic (2020q1), the company's stock price, deflated by the market index, saw an unprecedented surge above its historical trend, seemingly unstoppable, as investors bet on a future where e-commerce dominance was absolute. However, a series of necessary corrections in the stock market followed as the e-commerce landscape gradually normalized back to pre-pandemic trends. This situation reveals the pitfalls of overestimating the permanence of COVID-19's influence and serves as a stark reminder of the importance of accurate economic assessments without any exaggeration.

Figure 5: Combined plots of HP on Amazon with DJIA and SP500. Vertical line refers to 2020q1. "ad" stands for the ratio of the Adjusted Closing Price of Amazon with respect to DJIA, and "as" refers to the ratio of the Adjusted Closing Price of Amazon with respect to SP500.



[7] We collect data on the stock market indicators, i.e., DJIA and SP500, from the FRED database of St. Louis Federal Reserve Bank. The data on the Amazon stock prices come from Yahoo.com.

In relation to literature, our findings are far from being exceptional. In a study surveying nine countries whose summary is shown in Table 2, UNCTAD (2020) discovers that, even early on during the pandemic experience, not many consumers were ready to just ditch the brick-and-mortar stores. Likewise, Alcedo et al. (2022), through a much larger multi-country study, find that the changes in shopping behavior as a result of the pandemic are transitory.

Table 2. International Shoppers' Anticipated Attitudes Toward Future Shopping

Response	Very/Quite likely	Not really
To focus purchases more on essential products	55	45
To shop more often online	53	47
To browse and spend more time on digital entertainment sites	42	58

Question: "How likely do you think you will continue to adopt the habits adopted during the COVID-19 emergency outbreak at the end of this period?" Total sample N=1819; Single answer. Source: UNCTAD (2020).

Finally, based on our findings, as for the policy proposal, we simply suggest that firms should not embark on a hiring binge before clearly understanding the consequences in the economy. Otherwise, they would be hiring more employees than they normally would need. Eventually firing them would leave a bad image of the firm, to say the least. This does not necessarily mean that businesses should not increase their workforce as a response to an event such as COVID which requires a more labor-intensive business model, but we suggest that firms should make preparations for exceptional events by taking advantage of technology and/or unconventional hiring practices. As for the market investors, we also would like to caution against overreaction to temporary price surges. The overreliance on the idea that the change, when it happened, is not reversible caused a massive surge in the valuation of these stocks, as it is presented for Amazon, and then necessitated corrections when the e-commerce converged to the pre-pandemic trend.

6. Conclusions

In recent years, due to the widespread availability of devices that provide easy access to online shopping venues coupled with the increased technical knowledge base, more and more people have had some online shopping experience. However, COVID-19 came as a natural experiment that forced people to go online whether they liked it or not. This phenomenon raised expectations that, as people practiced new shopping experiences with the help of technology, they would keep these newly acquired technical skills and "migrate online" in large numbers to do their everyday shopping. In other words, such an outcome would almost certainly spell the obituary of brick-and-mortar stores.

However, that expectation did not necessarily materialize as people reverted to their old habits as soon as pandemic-related fears disappeared. Through our econometric analysis, we find that COVID-19 did not permanently impact people's shopping behavior. We conjecture that this finding is consistent with the habit formation theory, which states that people stick with their old habits rather than switching to new ways of doing business. Old ways represent familiarity, which is safer than uncertainty, where the latter carries some risks. In other words, learning new ways of doing business is costlier and riskier than habit formation. Alternatively speaking, we think that once people learn a particular skill, they continue to enhance it rather than switching to new ways of doing business. Specifically speaking, people did not migrate to online shopping in troves in the pre-COVID-19 era, not because of technological entry barriers but rather due to the comfort of practicing familiar in-store shopping.

As is well known in the literature, consumer behavior would have direct (or indirect) effects on the corporate world in terms of supply, finances, and the markets. That is why, firms have been found to accommodate the change in consumer behavior including the corporate response to the COVID-19 pandemic.

While observing consumers' behavior and firms' excessive initial reaction to it, we propose that firms should study consumer behavior in depth before adopting knee-jerk policies leading to undesirable outcomes. Not only do these reactions have financial consequences for the firms, but also generate bad images in the eyes of the public such as the case of lay-offs of redundant (unnecessarily) hired workers during the early phases of the pandemic.

Our study is carried out on US data. As discussed above, research done on international data also has reached similar conclusions. As an extension, this research could be replicated with more granular data, such as more disaggregated data on shopping habits.

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