

Hoarding in the age of COVID-19

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Abstract

Hoarding is a well-established phenomenon in economics, often explored in the context of savings, financial speculation and employment. Conventional economic models of hoarding cannot, however, easily explain some of the unusual hoarding behaviours observed during the COVID-19 pandemic. This paper extends the economic analysis of hoarding by incorporating multidisciplinary explanations for some of the anomalies in hoarding observed during the COVID-19 crisis. This multidisciplinary approach suggests that behavioural economics and behavioural science can provide rich insights for policy-makers to use in adapting their policies to limit the negative economic, social and psychological impacts from anomalous hoarding behaviours during pandemics.

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Keywords

COVID-19 — hoarding — consumption — savings — herding

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Introduction

The COVID-19 pandemic has revealed some fascinating behavioural quirks which are difficult to explain using conventional economic theory. The strange phenomenon of toilet paper hoarding provided some light relief from shocking headlines about COVID-19's brutal spread across the globe, but hoarders' unusual buying patterns, for example the panicked buying of toilet paper, is difficult to explain in purely economic terms. Standard (non-behavioural) economic analysis cannot easily capture either the precisely targeted nature of COVID-19 consumption hoarding by individuals nor its transmutation into a global phenomenon. This paper aims to fill this gap via a behavioural economic approach, also bringing in multidisciplinary insights from behavioural sciences to unravel the mystery of how and why a global pandemic might trigger unusual and widespread hoarding.

The paper begins with an outline of some of the key features of hoarding in standard (non-behavioural) economic models. Traditionally, economic theory focuses on households hoarding savings, not consumer goods, so consumption hoarding is difficult to explain from a standard economics perspective. Moving beyond standard economic models, insights from behavioural economics and behavioural science help to explain some hoarding anomalies and specifically the two puzzles of 1. idiosyncratic hoarding: the hoarding of unusual goods such as toilet paper in excessively large quantities; and 2. mass hoarding: the cascade of unusual hoarding behaviours through groups of people and around the globe. The paper concludes by applying the lens of behavioural economics to assess policymakers' COVID-19 responses. In the context of hoarding, were policy responses appropriate in either mitigating or leveraging hoarding behaviours through the crisis?

How can policies be improved in preparation for second waves of the COVID-19 crisis, future pandemics and other global crises?

Hoarding in economic models: General insights

How do economic models explain hoarding in general? Hoarding is defined as acquiring a good, service or asset in excess of immediate needs and it is not out of place in standard (non-behavioural) economic models. A variety of hoarding concepts are commonly studied in economics and finance – for example in the context of household savings, speculative trading and labour hoarding. From the microeconomic perspective of an individual consumer/householder, hoarding of savings is a more common feature in standard economic models than consumption hoarding. Householders divert flows of income into savings and postpone consumption of goods and services until a future date. Savings will earn interest, magnifying the value of saved income and enabling householders to buy more consumer goods in the future than they could today. Households' stocks of wealth represent the accumulation of savings hoarded by households over time. Conversely (for those with stocks of wealth to spend), dishoarding of savings represents flows out of householders' stocks of wealth.

Different economic models capture this process of hoarding savings and accumulating wealth in distinct ways. To simplify across the spectrum between neoclassical and Keynesian approaches: in the seminal neoclassical consumption models, e.g. the lifecycle and permanent income models of Modigliani and Brumberg (1954) and Friedman (1957), consumers are assumed make rational choices by balancing

the benefits and costs of savings versus consumption over an entire life-time. In deciding the timing of consumption, assuming no borrowing constraints, householders will balance their streams of marginal utility from consumption through their lives in order to maximise the total utility they enjoy from the goods and services that they consume over a lifetime. In contrast, Keynesian models draw on Keynes's analysis in which householders make a simple decision in the current period either to spend their income by consuming goods and services today, or to save their income to fund consumption tomorrow (Keynes 1936).

Given this focus in standard economic models on hoarding of savings for the future and consuming goods and services in the present, consumption hoarding is not a standard feature of non-behavioural economic models. Neither Keynesian nor neoclassical models say much about consumption hoarding – except when durable consumption goods (cars, jewellery etc.) have a hybrid nature as a store of value, and have transmuted into assets that are hoarded as a form of wealth. Even when returns from hoarding these types of consumption goods are low because asset appreciation is less likely (e.g. for cars¹) or gains in value are likely to be modest (e.g. for jewellery and other precious household items), hoarding may still be reasonable when interest rates are low to negative.

Savings and consumption through the COVID-19 crisis

There is little doubt that COVID-19 has disrupted patterns of consumption, savings and asset accumulation. As noted above, standard (non-behavioural) economic analyses of hoarding focus on the balance between savings and consumption, with hoarding usually focussed on savings. Unsurprisingly, the COVID-19 crisis has triggered the spending of hoarded savings, with household wealth eroded by early access to superannuation funds, increased mortgage borrowing (e.g. via equity withdrawals from property ownership), and increased credit card borrowing. For many households, spending down of wealth has been necessary given the large hit to household finances for those facing unemployed or underemployment, those on furlough, others with precarious future job prospects, and those experiencing wage cuts because of collapses in economic activity in specific sectors – for example traditional retail, travel, tourism and education. But patterns have been mixed across different groups and sectors, with serious implications for increasing wealth inequality as well as income inequality.

Dishoarding of savings and erosion of wealth stocks by those facing negative financial impacts from COVID-19 has coincided with increased asset accumulation by those who have money to invest – either because they are high net worth individuals or because they are employees with secure jobs

¹Second-hand assets can be imperfect stores of wealth, however. One explanation is Akerlof's lemons principle of adverse selection, which explains the erosion of value in second-hand markets where quality of products is not observable by buyers (Akerlof 1970).

and/or working in sectors that have benefited from the structural and sectoral shifts in economic activity triggered by the COVID-19 crisis. In terms of asset accumulation more generally, focussing on the hoarding of gold as a totemic asset: since 17 November 2019 – when the first officially documented COVID-19 case was reported in Hubei Province, China² – spreads between spot and forward gold prices have increased significantly. The large overall gains in the gold price are illustrated in Figure 1 and suggest that investors rushed towards gold.



Figure 1. Gold Price 2019–2020
(Source: www.bullionvault.com)

This hoarding of gold was predictable given that gold is commonly used as safe haven asset in times of crisis and extreme uncertainty. There is some evidence of speculative activity with consumption goods too: a small minority of toilet paper purchasers were driven by a speculative motive in attempting to make large profits over the short-term. For example, in the early days of the COVID-19 crisis, toilet rolls were listed on eBay in Australia at prices up to AU\$1,000,000 for 600 rolls – AU\$1,667 per roll (Baddeley, 2020). But this was a short-lived phenomenon and most consumers were not accumulating toilet paper to re-sell it.

Although consumption hoarding is not easy to explain in economic terms, given the general atmosphere of volatility and uncertainty, it is not surprising that COVID-19 disrupted established patterns of consumption. As illustrated in Figure 2, consumer demand has shifted to and from specific types of stores in the US. Food services, drinking places and clothing/clothing accessory stores have been hit particularly hard.

²The Guardian (2020), "First Covid-19 case happened in November, China government records show-report", 13 March 2020, [theguardian.com/world/2020/mar/13/first-covid-19-case-happened-in-november-china-government-records-show-report](https://www.theguardian.com/world/2020/mar/13/first-covid-19-case-happened-in-november-china-government-records-show-report). Downloaded 23 May 2020.

Consumers' buying habits have shifted radically because of social distancing – both the legislated measures and voluntary choices for those especially worried about the spread of the disease. Aside from these external barriers to consumption, consumers' preferences have shifted towards staples and necessities, as well as products that are associated with stress, anxiety and ill health – for example alcohol, cigarettes and pharmaceuticals – with Figure 2 showing that the stores selling these products in the US have been winners in terms of sales growth.

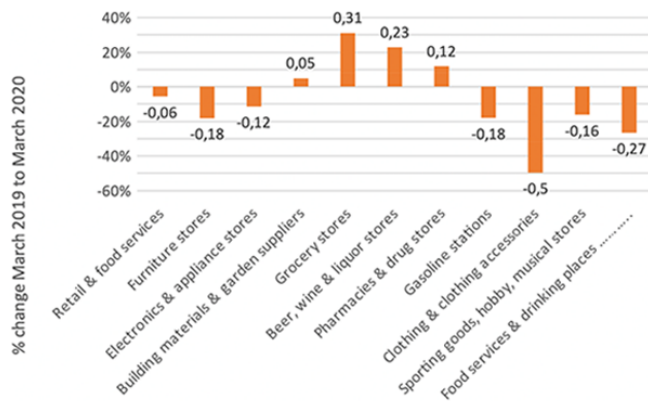


Figure 2. US Sales Growth, 2019–2020
(Source: Advance Monthly Retail Report CB20-69, US Census Bureau)

Shifts in behaviour and habits also shifted patterns of consumption for specific items. Apparently excessive purchases of toilet paper may not have been hoarding if large numbers of households suddenly needed to buy a lot more toilet paper than usual. COVID-19 dramatically changed household consumption patterns – for example, with many more people at home for longer hours, domestic use of toilet paper increased significantly, and workplace use plummeted. With perfect markets, one could just substitute for the other, but domestic and workplace toilet paper are not perfect substitutes. Product differentiation, different production processes and distinct supply chains for domestic versus business uses meant that domestic demand by households could not be quickly and easily fulfilled by supplies diverted from workplaces (Williams, 2020).

Another potential explanation is rational forward planning. For example, a rational agent will hoard some consumption goods if they are hoarding in preparation for future shortages (Lucy, 2020; Yap, 2020). This makes sense if they are planning to use up these goods in the near term, assuming low storage costs. But the rational consumer would balance the benefits of hoarding against the opportunity costs of hoarding and for something like toilet paper – a bulky item, inconvenient to purchase and store in large quantities – it is not clear that the benefits of hoarding are enough to balance the opportunity costs. Also, there was little evidence that there would be substantial supply chain disruptions. Suppliers reassured

people that there should be no interruptions to toilet paper supply chains, especially as most toilet paper is produced domestically. Their reassurances were well-founded and toilet paper was easy to buy again from May onwards.

Similar insights from an operations management perspective suggest that hoarding was about accumulating buffers and 'safety stocks' in anticipation of likely shortages. Similarly, consumers engaging in 'phantom ordering' were perhaps ordering more than they needed to boost demand because of likely shortages – a phenomenon also seen, for example, during World War II (Sterman & Dogman, 2015). In times of crisis, hoarding of consumption goods also makes sense if rationing is expected – again a common response in times of war and natural disaster when expectations of rationing are well-founded. But through the COVID-19 crisis, hoarding was not a response to expectations of rationing. Instead rationing was a response to hoarding: hoarding created artificial shortages necessitating rationing. Also, neither the safety stock motive nor expectations of rationing explain why did consumers hoard so much more than they needed of a very specific item such as toilet paper?

Hoarding under uncertainty: Insights from behavioural economics

The standard economic explanations outlined above can only answer parts of the COVID-19 hoarding puzzle. Much more becomes intelligible once insights from behavioural economics, especially insights around decision-making under uncertainty, are taken into account. Whilst pandemics are not at all unprecedented, pandemics have never spread so far and so fast – with globalisation enabling people to move quickly, cheaply and easily. The COVID-19 episode has generated complex ramifications which are unprecedented in recent memory. The type of uncertainty that the COVID-19 crisis has created is not the quantifiable 'Knightian risk' seen in standard economic models. We are in a world of Knightian uncertainty – we are living through events that are unprecedented and therefore not solvable by reference to conceptions of risk measured in terms of the frequency of previous similar events.³

Reflecting the extreme uncertainty generated by the COVID-19 crisis, financial markets have been dominated by volatility. Figure 3 plots the VIX 'Fear' index of financial market volatility. This closed at US\$12.46 on November 18, 2020 and peaked at US\$82.69 on March – a dramatic increase of 564% from the beginning of the COVID-19 pandemic. As of June 2020, the VIX Index is rising again as markets absorb news about the range and magnitude of negative economic and political impacts associated COVID-19 lockdowns.

With uncertainty, rationality is bounded – not just by constraints on information but also by constraints on cognitive

³Frank Knight made the distinction between quantifiable risk – Knightian risk, and unquantifiable uncertainty – Knightian uncertainty (Knight, 1921). See also Keynes's (1921) analysis of unquantifiable uncertainty as a challenge to these 'frequentist' conceptions of probability.



Figure 3. VIX 'Fear' Index
(Source: Yahoo Finance)

processing (Simon, 1955; Simon & Newell, 1958). In a complex and uncertain world, people will use heuristics to guide their decision-making (Baddeley, 2016; 2018b). In some environments, heuristics can be ecologically rational tools that improve decision-making; simple heuristics that ignore information can be efficient cognitive processes (Gigerenzer & Brighton, 2011). In a parallel literature on heuristics, Kahneman and Tversky (1974), analysed a range of heuristics and their impacts in terms of systematic behavioural biases.

Drawing on the behavioural economic literature on heuristics and bias, there are two COVID-19 hoarding puzzles that a combination of behavioural economics and behavioural science can help to solve. The first puzzle is idiosyncratic hoarding: why was hoarding targeted at such a very narrow range of goods – notably toilet paper – and in such unnecessarily large quantities? The second puzzle is mass hoarding: how did this idiosyncratic hoarding spread so quickly and widely to become a mass hoarding phenomenon on a global scale?

Idiosyncratic hoarding

Why was consumption hoarding focussed on such a narrow and selective set of consumption goods? Toilet paper hoarding seems especially mysterious to most people. For those who did contract COVID-19, or thought they were likely to contract COVID, the need to use more toilet paper than usual might be explained by diarrhoea, but this is not a common Coronavirus symptom. Even if people were buying toilet paper because it is a close (and cheap) substitute for the tissues they use when they have colds and flu, why would people buy toilet paper in such large quantities – more than could be used over many months, or useful for flu or a bad cold? The fact that some people were purchasing very large quantities and attempting to return them to the shops within weeks does not fit well with the idea that toilet paper hoarding was the outcome of the rational planning decisions hypothesised in standard economics. Evidence that the disproportionately large purchases of toilet paper were an example of poor planning are the news stories about hoarders trying to return their toilet

paper purchases back to the stores within just weeks of their original purchase.⁴

Heuristics can help to explain – for example, Tversky and Kahneman (1974) describe availability heuristics via which decision-makers use information that they can access quickly and easily – i.e. information which is readily available, including recent events and experiences, and emotions. The problem with the availability heuristic is that it leads decision-makers into over-weighting immediate and tangible benefits and costs, and under-weight delayed and intangible benefits and costs. This also connects with behavioural economic insights about present bias – the tendency towards excessive short-termism (Rick & Loewenstein, 2008). Chapman and Loewenstein (2020) have applied these insights in analysing some of the other COVID-19 policy challenges around compliance with social distancing and handwashing to limit the spread of the pandemic. These insights can also be applied to idiosyncratic consumption hoarding. Being unable to clean ourselves with toilet paper has the potential to impose very immediate and tangible loss in terms of social humiliation – a loss we will take large risks to avoid. Limits to people's capacity to make rational forward-looking plans for the future under conditions of extreme uncertainty and unknown risks, makes the tangible and immediate social costs associated with running out of toilet paper more salient.

Emotions will also play a role, linking to the affect heuristic – a specific example of the availability heuristic (Slovic, 2007). Emotions are quick and easy to access, and they operate as a form of non-cognitive short-cut, linking to the idea that non-economic drivers associated with our evolved instincts played a role in COVID-19 hoarding. Psychologists have identified that it is symptomatic of a desire to control bodily functions in the face of fear of illness, linking to the need for security and comfort in a stressful situation (Lucy, 2020; Yap, 2020). Evolved instincts dominate in stressful situations, as a response to panic and anxiety. During times of stress and deprivation, many animals have been shown to have a propensity to hoard and Preston (2020) attributes this to complex neural responses that have their roots in our evolutionary history. Not only are we hard-wired to hoard through times of stress and anxiety, we will also punish others that hoard along with us.

Also, psychiatric analyses of hoarding suggest that anxieties triggered by traumatic events can trigger hoarding (Hombali et al., 2019). Psychoanalytic insights have power in explaining idiosyncratic hoarding if we allow that some objects take on symbolic value. For example, psychoanalytic insights about financial market instability focus on financial assets as 'phantastic objects', i.e. objects that tap into unconscious emotions, triggering excitement and greed (Tuckett & Taffler, 2008; Tuckett, 2011).⁵ Perhaps toilet paper also takes on a

⁴[abc.net.au/news/2020-04-15/supermarket-shopper-tries-to-return-coronavirus-hoardings/12149548](https://www.abc.net.au/news/2020-04-15/supermarket-shopper-tries-to-return-coronavirus-hoardings/12149548), [afr.com/companies/retail/woolworths-bans-change-of-mind-returns-to-curtail-hoarding-20200310-p548k1](https://www.afr.com/companies/retail/woolworths-bans-change-of-mind-returns-to-curtail-hoarding-20200310-p548k1)

⁵See also Winslow (1986) on links between Freud and Keynes on the theme of love of gold.

symbolic value as a phantastic object, symbolic of COVID-19's tragic complexities for a modern world in which our anxieties around illness are repressed, and conscious thoughts and conditioning lead us to believe that illness and death are somehow abnormal. The problem is that these psychoanalytic interpretations are difficult empirically to test, though recent advances in Big Data and text analytics may enable this sort of analysis.

Mass hoarding

Another puzzle is the mass nature of the hoarding phenomenon. Standard economic models of consumption from mainstream economics focus on micro-level drivers of rational individuals' decisions, and cannot easily provide an explanation for the fact that idiosyncratic hoarding transmuted into mass hoarding on a global scale.

Toilet paper hoarding was a collective phenomenon – spreading quickly around the world. Detailed reliable data on specific consumption patterns is not yet available, but there is early evidence about toilet paper hoarding. Figure 4 depicts Statista estimates for 16 countries, capturing toilet paper hoarding and its estimated impact on toilet paper revenues for March 2020.

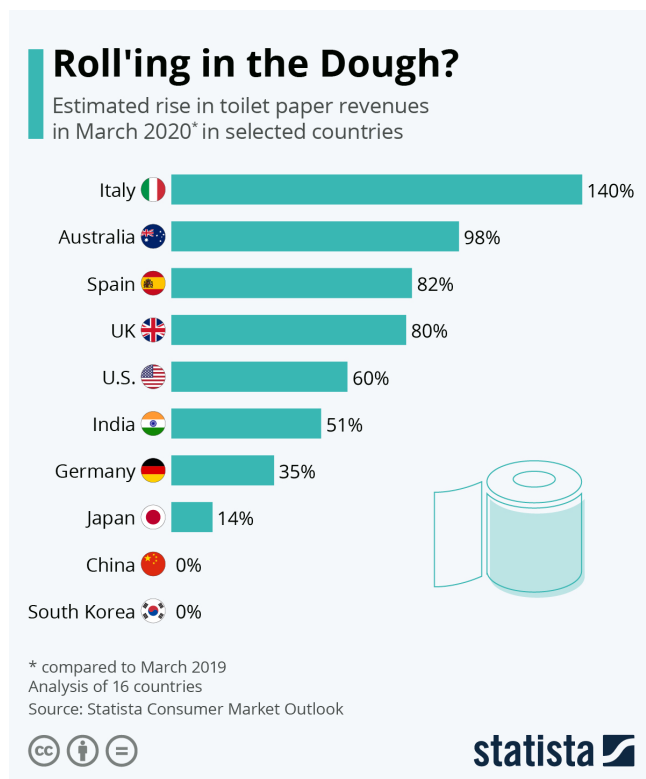


Figure 4. Estimates of Toilet Paper Revenues, March 2020 (Source: www.statista.com/chart/21327/rise-in-revenue-toilet-paper-selected-countries/)

The mass hoarding through COVID-19 can be explained by reference to behavioural economic analyses of bandwagon

effects, herding and social learning. Leibenstein (1950) explains interactions between individuals' consumption as the outcome of bandwagon effects and snob effects generating "non-additivity" in the demand relationship. Leibenstein's analysis of collective consumption is paralleled in the literature on herding. People follow others because herding is used as a type of herding heuristic to save time and cognitive effort in thinking independently, especially in situations of extreme uncertainty and ambiguity (Baddeley, 2010; 2018a). When other people's choices might be a useful source of information, we follow others because we infer that they have good reasons for their actions (Banerjee, 1992; Bikhchandani, Hirshleifer & Welch, 1992; 1998). The classic example from economic models of herding is the restaurant queue. When we see two restaurant queues, we infer that each person in a queue has information about the relative quality of the two restaurants, and a longer queue is a signal that more people believe it to be a better restaurant. So, people join long queues because they conclude that everyone else queuing knows which restaurant is better. This herding phenomenon has been verified in field experiments (Fishman, Fishman & Gneezy, 2019), as well as general lab experiments (Anderson & Holt, 1996; 1997). Similarly, in the early days of the COVID-19 Crisis – people observing others buying toilet rolls, could simply have been inferring that other people had good reasons for buying toilet paper and so copied them.

Other times, our reasons for following others may be less rational. Collective decision-making can be driven by emotional influences, peer pressure and group think rather than a reasoned process – the outcome of a form of mob rule (Baddeley, 2018a). In his 1895 classic – *The Crowd: A Study of the Popular Mind*, French polymath Gustave le Bon explored how and why mobs form – hypothesising that mobs take on a life and personality of their own, separate and distinct from the individuals within the mob. Also, numerous experiments from social psychology have shown how blindly susceptible we can be to the influence of others. Applying these insights to COVID-19, mass hoarding of specific consumption goods may reflect something similar. For example, Paloyo (2020) argues that toilet paper hoarding has similarities to a banking run. Emotions dominate decision-making in times of stress and crisis, and play a role if people have a *fear* of missing out when they see others rushing together. They worry that they will run out of toilet paper, and so they follow the herd in rushing to the shops to buy as much as they can find – like savers rushing to the bank when they fear their bank will run out of money.

Policy lessons and conclusions

The policy lessons from the COVID-19 crisis are complex and unpredictable. There is no doubt that there will be an enormous negative economic hit in terms of unemployment, rising inequality and decreasing wellbeing. In the complex COVID-19 world, it is hard to draw clear conclusions about what policy-makers should sanction, incentivise or nudge. Were

policy-makers' responses appropriate in mitigating versus leveraging hoarding? From the perspective of the individual consumer, being nudged towards better consumption choices (i.e. not over-spending on unnecessary quantities of consumer goods) makes sense, but hoarding can also generate some positive externalities at a macroeconomic level. Analysis suggests that hoarding of consumer goods had some positive macroeconomic impacts – for example Australia suffered just a mild dip in GDP growth through the March 2020 quarter, as the hoarding of toilet paper and other household items boosted retail sales and bolstered the economy (Janda, 2020).

A combination of insights from behavioural economics and behavioural science can help policymakers to navigate the many complexities in economic and financial decision-making that have characterised the COVID-19 pandemic. Encouraging consumption over hoarding savings is a good thing but some countries' policies around running down superannuation balances may have dangers in the long-term if spending savings now means that people will be more vulnerable to poverty in retirement and/or if people can too quickly and easily run down their superannuation balances in a panicked rush. Disincentivising hoarding of essential items could be implemented with co-operation from retailers, as long as the problem of increased hoarding triggered by expectations of rationing is addressed. If idiosyncratic patterns of hoarding are reflecting stress and anxiety, then careful management of emotional responses is essential in governments' communication exercises. Too much fear and society panics, but too little fear and people will feel free to ignore rules and guidelines – for example around social distancing, mask wearing and contact tracing apps – because they are not motivated to worry about the consequences (Flinders et al., 2020). Overall, policy-makers are facing some very tough challenges in managing all these complexities in the context of profound uncertainty. They not only have to judiciously manage trade-offs between health outcomes and economic impacts, but also the delicate emotional balance that determines whether people are taking sensible precautions or lurching into panic.

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