Money and Barter in the Field: Evidence from the Life and Death of a Digital Currency

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Abstract

This paper studies the rise and fall of a redeemable digital currency in a large Toronto-based barter community using comprehensive and high-frequency data on barter and monetized transactions. The observed effects of unexpected monetary experiments are consistent with only a subset of New Monetarist theories. I find that monetary expansion persistently increased monetized transactions, reduced token velocity, and did not affect barter volume. Partial and complete halts in redemption meaningfully changed neither token prices nor supply, but decreased token acceptance, transactions, and velocity. My findings reveal roles for price coordination frictions, partial acceptability, endogenous search and redemption, and community enforcement.

Keywords: barter, money, medium of exchange, redemption
JEL: E42, E52, E65

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1 Introduction

Economists have long hypothesized that money exists to overcome the inefficiencies of barter.[1] The New Monetarist literature develops this theory. Its approach is to assume particular informational environments and sequences of pricing and trade decisions, and then to characterize transaction behavior in an equilibrium framework or in a controlled laboratory.[2] Decades of this inquiry has yielded many valuable findings regarding money and barter in simulated environments.

However, there is very little evidence on money and barter from the field. Barter transactions in real-world settings are typically informal and unrecorded, so researchers often rely on anecdotes.[3] The best available data comes from Colacelli and Blackburn (2009), who collected survey responses during the 2002 Argentine Crisis when barter was widespread. Due to the lack of evidence from the field, it remains unclear whether New Monetarist assumptions and findings are consistent with the actual conduct of monetized and barter trade. For this reason, historians and anthropologists have criticized New Monetarist ideas as having little grounding in facts.[4]

The advent of digital currencies and online platforms present new opportunities to study money and barter in the field. In this paper, I introduce data from a digital barter platform named Bunz, where the conduct of trade is very similar to that which is studied in the theoretical and experimental literature. Like other bartering communities, Bunz emerged in the wake of an economic downturn to facilitate trade amongst a cash-strapped population.[5] Its participants were primarily young millennial adults in Toronto. Through the Bunz mobile app platform, they met and traded second-hand items such as clothing, accessories, plants, and groceries. The community's founder forbade cash, however. Therefore the platform's roughly ten thousand daily active users initially had to barter. The platform later introduced a digital token, named BTZ, which could be transferred

[1] See, e.g., Smith (1776); Jevons (1875); Clower (1967); Ostroy and Starr (1974).

[2] For surveys of the theoretical literature, see Ostroy and Starr (1990); Lagos, Rocheteau and Wright (2017); Rocheteau and Nosal (2017). The experimental literature is also large and growing (e.g., Brown 1996; Duffy and Ochs 1999, 2002; Duffy and Puzzello 2014; Camera, Goldberg and Weiss 2019; Jiang et al. 2023; Camera 2024).

[3] For example, Radford (1945) described the emergence of cigarettes as a medium of exchange in a prisoners-of-war camp. Sweeney and Sweeney (1977) recounted how a recession of baby-sitting in a co-op on the US Capitol Hill was averted through expanding the supply of scrip (see also Krugman 1998).

[4] See, e.g., Mitchell-Innes (1913, 1914); Humphrey (1985); Goodhart (1998); Wray (2004); Graeber (2011).

[5] Both barter and private currencies became widespread during the 1930s Great Depression and the 2002 Argentine Crisis (Fisher 1934; Pearson 2003). In recent economic downturns, bartering communities with thousands of members popped up on online forums such as Facebook and Nextdoor to help people trade necessities without cash (Lerman 2020; Shilton 2020).

among users, or redeemed at designated local stores for retail goods at a fixed exchange rate.

The data set I introduce captures in real time all transactions arranged through the Bunz platform. It contains the universe of token issuances, token redemptions, and peer-to-peer token transfers. It also includes time-stamped information on the items that each user posted on the platform, the messages that users sent to each other, and the ratings that each user provided upon trade completion. Since a large amount of detail is available, these data represent a substantial improvement on previous information.

I focus on three large and unexpected monetary experiments that are observed in these data. The first is a quintupling of token supply in the Bunz economy resulting from increased direct token issuance to users in September and October 2018. The second is an abrupt and unexpected halt in token redemption for stores other than coffee shops and restaurants in September 2019, which caused an uproar widely reported in local news. The third is the complete halting of the redemption program, which was quietly announced as a temporary measure to address fraudulent behavior and was never reversed.

I document that the behavioral responses to these experiments are largely consistent with a New Monetarist model of redeemable money with price rigidity. Specifically, I incorporate redeemability into the Kiyotaki-Wright (1993) model of money as a medium of exchange. In this elemental model, agents randomly meet pairwise and decide whether to exchange a unit of money for a unit of a commodity. Agents may also redeem money for a consumable good from an exogenous player whenever a desire for that good arises. The possibility of redemption encourages agents to accept money and can eliminate the equilibrium where money fails to circulate. This is unlike models of intrinsically worthless money, where a non-monetary equilibrium always exists.

The model's predictions are then tested using the Bunz data and experiments. For causal identification, interrupted time-series designs are used to measure the effects of monetary events on token price, token acceptance, completed token-mediated transactions, and completed barter transactions. Trends in transaction activity prior to each of these events are verified to be stable. For robustness, a sub-sample of regular users that account for the large majority of transactions is analyzed. Further sub-samples of users who transact with different intensities are also analyzed.

There are three main findings. First, token prices were remarkably stable throughout the mon-

etary events, as assumed in the model. I measure token prices by computing the ratio between the posted BTZ price and the face value for a select set of frequently transacted store gift cards, since there is no centralized token exchange for price discovery. I find that token prices did not change in response to monetary expansion. More surprisingly, token prices did not change even after redemption was completed halted.

Second, monetary expansion persistently increased peer-to-peer transaction volume and reduced token velocity, as predicted. I measure transaction volume by counting the ratings that users provide for each other after each trade, and define transactions as token-mediated if there are concurrent token transfers between the same pair of users. I find that transaction volume persistently increased by 57% for almost a year, even after token issuance was reduced and token supply stabilized. The increase is entirely explained by an increase in token-mediated transactions. Meanwhile, the volume of barter transactions did not change, nor was there any change in token acceptance, or in the entry or exit of regular users. Token velocity fell after some delay.

Third, reductions in token redeemability sharply and persistently reduced token acceptance, transactions, and velocity, as predicted. The first reduction caused token acceptance, as measured by the share of items posted with a BTZ price, to immediately fall by roughly 8 percentage points from an initial level of 35 percent. Token-mediated transactions fell and stabilized at roughly 29 percent lower about one month after the event. The second reduction also caused token acceptance to immediately fall, by roughly a third. Unlike the first reduction, however, token acceptance and token-mediated transactions did not stabilize after a month but continued to slide for more than half a year. After half a year, token-mediated transactions, token acceptance, and token velocity had each more than halved.

The above findings support the New Monetarist proposition that money overcomes the inefficiencies of barter. Field evidence for this longstanding idea is very limited. Colacelli and Blackburn (2009) collect survey responses and show that participation in fiat-issuing exchange clubs is associated with increased consumption among bartering populations in Argentina. The evidence here instead leverages transaction-level platform data and high-frequency causal identification.

However, the finding that prices did not adjust in response to the end of redemption is *not* consistent with large classes of New Monetarist theories. For example, in the widely applied

Lagos-Wright (2005) model, prices quickly adjust to equate money demand and supply due to regular Walrasian market clearing. Instead, the evidence is more consistent with models with price posting and random matching, in which price coordination failures are known to arise (Green and Zhou 1998, 2002; Zhou 1999, 2003; Kamiya and Sato 2004; Kamiya, Morishita and Shimizu 2005; Kamiya and Shimizu 2006, 2007*a*,*b*, 2011; Jean, Rabinovich and Wright 2010; Kamiya et al. 2021). Related lab evidence has also shown that price determination protocols affects the responses of transaction behavior to monetary events (Jiang, Puzzello and Zhang 2023; Duffy and Puzzello 2022).[6]

The finding that redeemability had large effects on money acceptance is also noteworthy. A wide variety of real-world currencies—including bank deposits, pegged currencies, commodity-backed monies, and stablecoins—are redeemable. A large historical literature highlights the importance of redeemability in the operation of monetary systems (e.g., Mitchell-Innes 1913, 1914; Graeber 2011; Wray 2004; Schnabel and Shin 2018; Gorton and Zhang 2021). However, the dominant workhorse model in the New Monetarist literature—namely, Lagos and Wright (2005)—features universal acceptance of non-redeemable fiat money. To fit the Bunz data, tractable models of divisible money that feature redemption, partial acceptance, and price coordination frictions are needed. To my knowledge, such models have yet to be devised but may prove to be valuable.

Two auxiliary results are worth discussing. First, monetary events altered not only transaction volume, but also search and redemption behavior. For instance, in response to the monetary expansion, offer messages sent increased by 41%, while transactions per offer increased only by 11%. This finding suggests that the increase in trade is primarily explained by increased willingness to initiate trade. Moreover, in response to the first reduction in redeemability, redemption briefly spiked, as some users rushed to spend down their BTZ holdings. These margins of adjustment are typically absent from New Monetarist models.

Second, the platform's promise to redeem was disciplined in part by community enforcement. The first reduction in redeemability was widely reported in the news and had broad negative impacts on platform use. The number of items posted on the platform immediately fell, barter trans-

[6] Jiang, Puzzello and Zhang (2023) find that monetary expansion leads to inflation in an environment where subjects observe the full history of market prices. Meanwhile, Duffy and Puzzello (2022) find a lack of inflation or deflation in response to changes in money supply in an environments where subjects do not observe inflation or prices outside of their match.

actions fell, user entry fell, and user exit increased. These findings suggest coordinated retaliation against the platform's breach of trust. By contrast, the second reduction in redeemability was quietly announced and promised to be temporary, and it had very limited effects on barter transactions, items posted, offer messages sent, transactions per offer. The possibility of community enforcement is also generally ignored in the New Monetarist literature.

In summary, the contribution of this paper is as follows. I collect and describe rare quantitative data covering the universe of monetized and barter transactions from a real-world economy. I then devise, test, and confirm the predictions of a New Monetarist model of redeemable money with price rigidity using high-frequency causal identification. My results provide quasi-experimental field evidence that money overcomes the inefficiencies of barter. They highlight the importance of redeemability and price coordination frictions. They also reveal roles for endogenous search and redemption behavior, as well as community enforcement of redemption promises.

This paper relates to a growing empirical literature on digital currencies. One strand of this literature measures the effects of the availability of digital payment systems on consumption (Jack and Suri 2014; Beck et al. 2018; Xu, Ghose and Xiao 2019; Alvarez and Argente 2020*a*,*b*). Another strand analyzes the adoption of digital payment systems (Ackerberg and Gowrisankaran 2006; Aggarwal, Kulkarni and Ritadhi 2020; Li, McAndrews and Wang 2020; Ho et al. 2022; Crouzet, Gupta and Mezzanotti Forthcoming; Alvarez et al. 2023). A further strand documents runs on banks and digital currencies (Iyer and Puri 2012; Iyer, Puri and Ryan 2016; Liu, Makarov and Schoar 2023). None of these papers, however, analyze comprehensive data on both monetized and barter transactions. It is this unique feature of the data here that enables an empirical assessment of New Monetarist models.

The paper is organized as follows. Section 2 describes the setting and data. Section 3 presents the theoretical framework. Section 4 documents the effects of monetary expansion. Section 5 analyzes the effects of reduced redemption. Section 6 analyzes the transition to fiat money. Section 7 provides a discussion.

2 Background

This section describes the history of Bunz community, the mechanics of trade on the Bunz platform, and the features of the redeemable BTZ digital currency. It then introduces the data and presents descriptive statistics.

2.1 History of the Bunz Community

The barter community Bunz began in 2013 as a discussion group on the Facebook social media platform, created "to make city living easier for a cohort of millennials who graduated into a post-recession labour market and felt squeezed by precarious employment, stagnant wages and the soaring cost of living" (McIntyre 2019). In its early days, community members published posts in the group indicating that they were either in search of some item or were looking to get rid of some other item. Interested members would write back and offer to trade. Initially known as "Bumz", the community was highly popular among cash-constrained young adults in Toronto, who often posted funny commentary about local happenings in addition to the items they wished to trade. The community grew rapidly between 2013 and 2016. Roughly 200 Facebook groups were created, each dedicated to trading different types of items and discussion of different topics, some with thousands or even tens of thousands of members.

In early 2016, the community leaders decided to migrate the community's trading activities to a dedicated mobile app. The app's interface was designed specifically to enable users to post, search, and message each other about items to trade. The app had been independently developed by a separate company (Shufl Inc.). It had functionality similar to trading apps that later emerged, like Facebook Marketplace, but lacked users. The migration of Bunz community members onto the app provided the app with a user base, while Bunz community members benefited from improved trading experiences. However, the merger also created an ideological divide within the Bunz community. The company (henceforth, "Bunz HQ") was interested in growing the user base beyond the initial community and profiting from the app, while the community leaders, who continued to administer related Facebook discussion groups on a voluntary basis, wanted to preserve

the anti-capitalist ethos of the community.[7]

2.2 Trading Mechanics on the Bunz Platform

Because of the anti-capitalist spirit of its founder, the Bunz community had a rule: no cash. Instead, users were to transact through "true trades," i.e. barter.[8] Bunz HQ enforced this ban by taking down any item postings that requested cash, and the ban on cash was by and large observed by the app's users. According to textual analysis of messages sent between Bunz users, less than five percent of conversations mentioned cash or dollars.[9]

On the app, each user can post items for sale, maintain a public profile, which includes a short description of the user's trading interests, and provide an "ISO" (in search of) list, which indicates what types of items that user would be willing to accept. A posted item typically included a photo, a title, a description, and the location of the seller. If a user comes across an item she liked while browsing or searching, she would click a button to send an offer message to the seller, asking if he would be interested in any item that she posted ("Anything in mine?"). He would then browse her profile and message back to indicate whether there was any such item. If a possible trade was found, then the two would then message to arrange a time and location to meet. In the message screen, users are prompted to rate each other once they complete a trade. Appendix B.2 shows photos of the mobile app and examples of typical in-app interactions.

Due to the ban on cash, the need for double coincidence of wants posed an impediment to transactions on the Bunz app. Interviews with users reveal that transactions frequently failed because the buyer did not have an item that the seller desired. When a lack of double coincidence occurred, sellers often offered to complete the transaction through alternative payments as beer, gift cards, and transit tokens. These objects did not function as media of exchange in the Bunz economy, since these objects were typically procured by the buyer immediately before a transaction and directly consumed or used by the seller soon after the transaction. Such offers were occasionally rejected

[7] A fascinating article by McIntyre (2019), published in The Logic, provides a detailed and colorful account of the history of this merger, as well as useful context for the launch of BTZ and subsequent currency crisis.

[8] See Bunz FAQ in Appendix B.1.

[9] Interviews with app users in May 2019 revealed a range of opinions about the ban on cash transactions among users. Many interviewees, especially those who were involved in the administration of the Facebook groups, expressed strong agreement with the cash ban. However, at least one frequent seller admitted that they prefer transacting in cash and sometimes to tried to gently steer buyers towards paying in cash.

in favor of a "true trade" by users who prefer to barter.

Repeated interactions in the Bunz economy were exceedingly rare. Traders who met through the Bunz app were largely strangers who would not meet again. Exchange was almost always bilateral and simultaneous.[10] Traders were incentivized against opportunistic behavior such as no-shows and scams by a system where users could publicly rate and review each other after they agreed to trade. In interviews, many users reported that other users were typically trustworthy and friendly. The high level of trust on the Bunz platform led them to prefer using Bunz over other popular platforms such as Craigslist and Kijiji, where scams were more common.

2.3 Introduction of BTZ

In April 2018, Bunz HQ introduced "a brand new digital currency," BTZ, as part of a major app update. The stated purpose of BTZ was to facilitate trade within the app. At the time of BTZ introduction, each user was endowed with 1000 BTZ upon digital wallet activation inside the app. In addition to receiving BTZ from other users, users could earn extra BTZ directly from the app through the "Daily BTZ Drop" by opening the app and answering a survey. The goal of "Daily BTZ Drop" was to increase user traffic and BTZ adoption in the app. Users could also earn more BTZ by inviting friends to join the app or posting new items. Each item could now be posted with a BTZ price. BTZ could also be easily transferred among users by tapping on buttons on another user's profile or by scanning another user's QR code.

To promote the token and to ensure price stability, Bunz HQ created the "Shop Local" program, which allowed users to redeem BTZ for retail goods at partner stores around Toronto, such as coffee shops, at a fixed exchange rate of 100 BTZ to 1 Canadian dollar (CAD).[11] After accepting BTZ, the owners of local stores could then redeem BTZ for cash from Bunz HQ at the same fixed exchange rate. Other than token redemption through the Shop Local program, users could neither

[10] Credit among Bunz users was very rare. Interviewed users report receiving BTZ payments as deposit to secure a trade or because they anticipate that their cellular data will be wonky at the trading location. Users may also receive slightly deferred payment, when a new user cannot remember their digital wallet PIN, or when a reputable user who is low on BTZ promises to deliver BTZ after another imminent trade that has already been arranged. However, other than these very short-term credit arrangements, credit among Bunz users was not known. This absence of credit and banking in the Bunz economy is a departure from the macroeconomy that allows me to focus on the role of money as a medium of exchange.

[11] In 2018, the average exchange rate was 1 CAD to 0.77 USD.

buy nor sell BTZ for cash in the Bunz app. As such, the total supply of tokens on the app was strictly determined by token issuance by the app and token redemption by users at local stores. Appendix Figure A1 provides a graphical illustration of token flows through the Bunz economy.

2.4 Data and Descriptive Statistics

The data provided by Bunz HQ are extraordinarily rich and comprehensive. I observe the universe of BTZ token transfers with timestamps, amounts, and the identities of the sender and receiver. The BTZ holdings of every user at any moment can therefore be inferred. I also observe the ratings that users submit to the platform after a transaction, which allows me to identify barter transactions. In addition, I observe all items that users post, along with descriptions and timestamps. The full text of the messages that user sent to one another are also available. For each user, I observe a rich set of characteristics, including user geolocation and answers to the "Daily BTZ Drop" surveys, which asks for information such as demographics.

Despite their richness, these data have some limitations. First, the items transacted on the platform are typically used and highly non-standardized, and barter transactions feature no posted price, so it is often difficult to know the price or value of the traded goods. Because of this, my analysis focuses on the number of transactions, as measured by ratings sent and received, rather than the terms of trade. Second, there is no centralized exchange between BTZ and other currencies, so it is not possible to directly measure the token price. As explained further below, I measure the price level using a subset of item posts involving gift cards with both a face value in Canadian dollars and a posted BTZ price.

The Bunz user base consisted primarily of young, female, college-educated adults. Roughly 75 percent of survey respondents were between 18 and 34 years old. More than half reported to have completed a university degree at the bachelors or higher level. Users also exhibited a wide range of annual incomes. While roughly 27 percent of users reported annual incomes of less than $20,000, nearly 40 percent reported annual incomes higher than $50,000 (Appendix Figure A2).

The types of goods transacted on the platform are highly heterogeneous. About 21 percent of items posted were clothing. Another 10 percent is jewelry. Other commonly posted items include home products, grocery, beauty products, electronics, and books. The median item on the platform

has a posted price of roughly 10 Canadian dollars (see Appendix Table A1).

A small share of users account for a large share of transactions on the platform. We define *regular users* as those who have at least 10 transactions during the entire sample period, have at most 70% of transactions concentrated in one month, and were active for at least 6 months. Between September 2018 and August 2019, these users accounted for 8 percent of active users, but 83 percent of transactions as measured by ratings sent and received, 70 percent of items posted, and 70 percent of peer-to-peer BTZ transfers (see Appendix Table A2).

Among regular users, usage of the platform is highly persistent. During the week one year after their first message sent on the platform, more than 80 percent of regular users sent a message to another user (see Appendix Figure A3). To analyze effects of monetary events, the changes in user activity will be measured using not only the full sample of users, but also sub-samples, such as regular users and further subsets such as those with different levels of activity intensity.[12]

3 Conceptual Framework

This section provides an elemental New Monetarist framework for thinking about the Bunz economy. Specifically, I extend the Kiyotaki-Wright (1993) model of money to feature redemption and issuance. This model assumes that prices are rigid. It predicts that: (1) monetary expansion increases transaction volume but reduces money velocity, and (2) reduced redeemability reduces money acceptance, money velocity, and transaction volume.

Although this first-generation model suffers from some theoretical weakness, it suffices for illustrating the main economic mechanisms that drive this paper's basic empirical findings.[13] Sec-

[12] Appendix Table A3 shows that frequent users have broadly similar activity profiles as less frequent users. The barter share of transactions, level of token acceptance, offer messages sent per transaction completed, and mean size of BTZ flows are similar for users with different levels of total transaction volumes. Frequent users, however, receive fewer tokens from the platform, redeem fewer tokens, and post fewer items per transaction completed.

[13] The foundational weakness of first-generation models is the assumption of *indivisible* money and *indivisible* goods, so the price level is fixed by assumption. Subsequent models feature divisible goods and allow for price determination through bargaining (Shi 1995; Trejos and Wright 1995); they also introduce regular centralized markets for price discovery and tractable money holding distributions (Lagos and Wright 2005). The Bunz economy, however, did not have a regular centralized market, and goods in the Bunz economy were typically indivisible rather than divisible. Moreover, as shown below, prices in the Bunz economy were rigid, and money acceptance was an important endogenous margin of response. For these reasons, the Kiyotaki-Wright (1993) model is chosen over more sophisticated subsequent models to provide a simple framework for the findings.

tion 7 briefly discusses New Monetarist models in which price rigidity emerges as an equilibrium result. To limit the scope of this article, the development of a more sophisticated model with divisible money and endogenous prices that can fit the evidence is left for future work.

3.1 Setup

Consider a unit mass of infinitely-lived agents who produce, trade, and consume commodities. Consumption of a unit of a commodity yields utility $u > c$, where $c > 0$ is a transaction cost. Agents cannot consume their own product, but can hold either one or zero units of money. Initially, fraction $M \in [0,1]$ of agents are endowed with one unit of money. Both money and commodities can be stored at zero cost. However, money can never be consumed. Following consumption of a commodity, an agent produces one unit of a commodity instantaneously at zero cost. Agents discount utility with time preference $r > 0$.

Agents randomly meet pairwise at Poisson rate α. The tastes of the agents are heterogeneous. Upon meeting, the matched agents are able to consume the other agent's product with probability $x \in (0,1)$. With probability xy where $y \in (0,1)$, the pair has "double coincidence of wants," so they are able to consume each other's commodity. Following Section 3 of Rupert et al (2000), we assume that agents who hold money can produce and that in a double-coincidence meeting, the agents always barter rather than trade with money.[14]

To model redemption, we assume that a desire for a redemption good arises with probability ρ and at this point money can be redeemed from a token-accepting store for the redemption good for utility u. We can think of ρ as capturing the ease of redemption. We assume a unit of money is randomly issued to any agent without money at the same instant, so that total money supply stays constant. The rate of money issuance is $\sigma = \frac{M}{1-M}\rho$. This roughly matches the empirical setting, since as shown below, the Bunz platform kept the token supply largely constant except for two short periods of monetary expansion.

Agents choose strategies for deciding when to accept various commodities and money in order to maximize their expected discounted utility from consumption, taking as given the strategies of others. Let π denote probability two traders agree to a trade wherein one accepts money in

[14] Rupert et al (2000) provide a micro-foundation for this assumption.

exchange for the other's commodity.

The Bellman equations are as follows:

$$rV_1 = \alpha xy(u-c) + \alpha x(1-y)(1-M)\pi(u+V_0-V_1) + \rho(u+V_0-V_1) \quad (1)$$

$$rV_0 = \alpha xy(u-c) + \alpha x(1-y)\pi M(V_1-V_0-c) + \sigma(V_1-V_0) \quad (2)$$

where V_1 is the value of holding one unit of money and V_0 is the value of not holding money. The first term in the two equations denotes the utility flow from barter, the second that from monetized exchange, and the final that from money redemption or issuance. Appendix Figure A4 provides a graphical illustration of the state transitions.

3.2 Equilibrium

Following Wright (1999), symmetric evolutionarily stable steady-state Nash equilibria are considered.[15] The equilibrium is said to be monetary if $\pi = 1$ and non-monetary if $\pi = 0$.

In the model, it is possible for agents without money to prefer to wait for a helicopter drop rather than accept money. This is because agents can accumulate at most one unit of money, so only those without money can receive a helicopter drop. Accepting money therefore comes at the potential opportunity cost of receiving money for free. This opportunity cost is especially large when a large share of agents hold money. To rule out this unrealistic possibility, we assume that $M < \overline{M} \equiv 1 - c/u$.

Denote π_0 as the probability of agents accepting money in exchange for commodity and π_1 as the probability of agents willing to pay money for commodity. It follows that $\pi = \pi_0\pi_1$. Let $\Delta_0 = V_1 - V_0 - c$ and $\Delta_1 = u + V_0 - V_1$. It follows that:

$$\pi_j = \begin{cases} 1 \\ \in [0,1] \\ 0 \end{cases} \iff \Delta_j \begin{cases} > 0 \\ = 0 \\ < 0, \end{cases} \quad (3)$$

[15] This focus rules out the mixed equilibrium in Kiyotaki and Wright (1993), which the prior literature has shown to not be robust.

where

$$\Delta_0 = \frac{\alpha x(1-y)(1-M)\pi(u-c)+\rho(u-c)-(r+\sigma)c}{r+\rho+\sigma+\alpha x(1-y)\pi}, \tag{4}$$

$$\Delta_1 = \frac{(r+\sigma+\alpha x(1-y)M\pi)(u-c)+(r+\sigma)c}{r+\rho+\sigma+\alpha x(1-y)\pi}. \tag{5}$$

It is always the case that $\Delta_1 > 0$. Let $\rho_1 = \frac{rc(1-M)}{u(1-M)-c}$ and $\rho_0 = \frac{rc(1-M)-\alpha x(1-y)(1-M)^2(u-c)}{u(1-M)-c}$. It is easy to check that $\rho_1 > \rho_0$ and $\rho_1 > 0$. If $\rho > \rho_1$, then $\Delta_0 > 0$ regardless of π. If $\rho < \rho_0$, then $\Delta_0 < 0$ regardless of π. It follows that:

Proposition 1. *Suppose $M < \overline{M}$.*

1. *If $\rho > \rho_1$, there is a unique monetary equilibrium;*
2. *If $\rho \in [\rho_0, \rho_1]$, there is a monetary equilibrium and a non-monetary equilibrium;*
3. *If $\rho < \rho_0$, there is a unique non-monetary equilibrium.*

Proposition 1 highlights an important difference between redeemable money and intrinsically worthless money (for which $\rho = 0$). Redeemable money can have a unique monetary equilibrium, while intrinsically valueless money necessarily has an evolutionarily stable non-monetary equilibrium. This result may explain why in the historical record, monies consistently emerged from a credible promise of redemption by a state or financial institution and did not emerge spontaneously from barter. Moving to a monetary equilibrium in a decentralized economy without a credible promise of redemption by a large player is difficult.

Proposition 1 is closely related to models of fiat money where the government's policy regarding acceptance is taken as exogenous (Aiyagari and Wallace 1997; Li and Wright 1998). In those models, there exists a unique monetary equilibrium when a large enough fraction of the population exogenously accepts money. Our result follows from a similar logic. The main difference is that, to match the empirical setting, the measure of agents in the population who endogenously choose whether to accept money is held constant.

3.3 Testable Predictions

The model above matches many features of the Bunz economy. The goods traded on the Bunz platform are highly heterogeneous, the matching of traders through the app is frictional, traders engage in bilateral bargaining, and the wants of traders often exhibit lack of double coincidence. There is a token redemption program, whose availability varies over time, as well as direct token issuance to users, which as shown below kept the token supply largely constant except for two short periods of monetary expansion.

In this subsection, two sets of testable predictions are derived. To derive these predictions, note that peer-to-peer barter transaction volume is given by $T_B = \frac{1}{2}\alpha xy$, while peer-to-peer monetized transaction volume is given by $T_M = (1-M)M\alpha x(1-y)\pi$. Total peer-to-peer transaction volume is $T = T_B + T_M$. Peer-to-peer token velocity is $v_M = T_M/M$, while redemption token velocity is $v_\rho = \rho/M$. Total consumption (excluding that from redemption) is $\varphi = 2T_B + T_M$. The ex ante expected utility of all agents (including that from redemption) is $W = \frac{1}{r}\left[(u-c)\,\varphi + uM\rho\right]$.

The first prediction is that, if redemption is widely available, so money is accepted, then increasing M away from zero persistently increases monetized peer-to-peer exchange, total consumption, and ex ante welfare. However, barter transactions remains constant. Furthermore, peer-to-peer and redemption token velocity falls.

Prediction 1. *Suppose $\rho > \rho_1$ and $M < \min\{\overline{M}, \frac{1}{2}\}$. If M increases, then:*

1. *Token acceptance is unchanged;*
2. *Peer-to-peer monetized transaction volume increases;*
3. *Barter transaction volume is unchanged; and*
4. *Both peer-to-peer and redemption token velocity decrease.*

The second prediction is that, as redemption availability falls, a non-monetary equilibrium emerges; if the fall is very significant, then the monetary equilibrium may disappear altogether. A transition from the monetary equilibrium to the non-monetary equilibrium causes declines in monetize peer-to-peer exchange, token velocity, total consumption, and ex ante welfare. However, barter is unaffected.

Prediction 2. *Suppose $M \in (0, \overline{M})$. If ρ declines from above ρ_1 to below ρ_0, then:*

1. *Token acceptance decreases;*
2. *Peer-to-peer monetized transaction volume decreases;*
3. *Barter transaction volume is unchanged; and*
4. *Both peer-to-peer and redemption token velocity decrease.*

4 Effects of Monetary Expansion

This section documents the effects of monetary expansion on transaction behavior on the Bunz platform. In September 2018, Bunz HQ dramatically and unexpectedly increased token issuance, resulting in a fivefold monetary expansion. Consistent with Prediction 1, monetary expansion did not affect token prices or acceptance, but instead increased transaction volume and reduced token velocity.

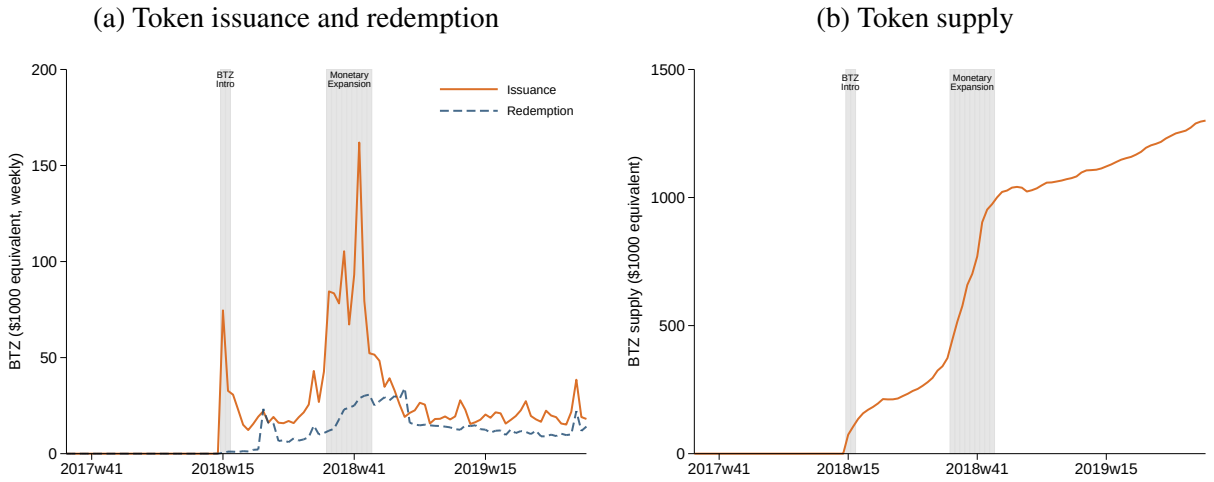
4.1 Token Supply

Token issuance. There were two waves of increased token issuance in 2018. As shown in the orange line in Figure 1 Panel (a), the first took place in April (Week 15), when the token was first introduced and each user who activated their BTZ wallet received 1000 BTZ (which is equivalent to 10 CAD). Token issuance is defined as the weekly sum of tokens transferred from Bunz HQ to users, excluding local stores and Bunz employees.

The second and larger wave of token issuance occurred in September and October (Weeks 36-42), when Bunz HQ increased the amount of Daily BTZ Drop to 100 BTZ per day from 10 BTZ per day in hopes of increasing use of the token. After roughly eight weeks of increased token issuance, however, Bunz HQ realized that the resulting pace of token redemption would be financially unsustainable. Bunz HQ then reverted back to Daily BTZ Drops of 10 BTZ per day.[16]

[16] As mentioned in Section 2, the "Daily BTZ Drop", wherein some quantity of the token was transferred from Bunz HQ to a user after the user answered a survey question each, was the primary method for Bunz HQ to change the amount of the token in circulation. The "Daily BTZ Drop" is similar to the idea of a "helicopter drop" in monetary economics (Friedman 1969; Bernanke 2002), wherein cash were directly added to the bank accounts of all citizens, as if dropped from a helicopter overnight.

Figure 1: Token issuance, redemption, and supply, before and after monetary expansion



Notes: Panel (a) shows the weekly trend in BTZ issuance, the total amount of tokens sent from Bunz directly to users, and BTZ redemption, total amount of tokens sent from users to local stores. Panel (b) shows BTZ supply, the cumulative sum of BTZ issued minus the cumulative sum of BTZ redeemed. All numbers are denominated in the Canadian dollar (CAD) at the fixed exchange rate: 1 CAD = 100 BTZ. Gray bars indicate the first and second wave of monetary expansion.

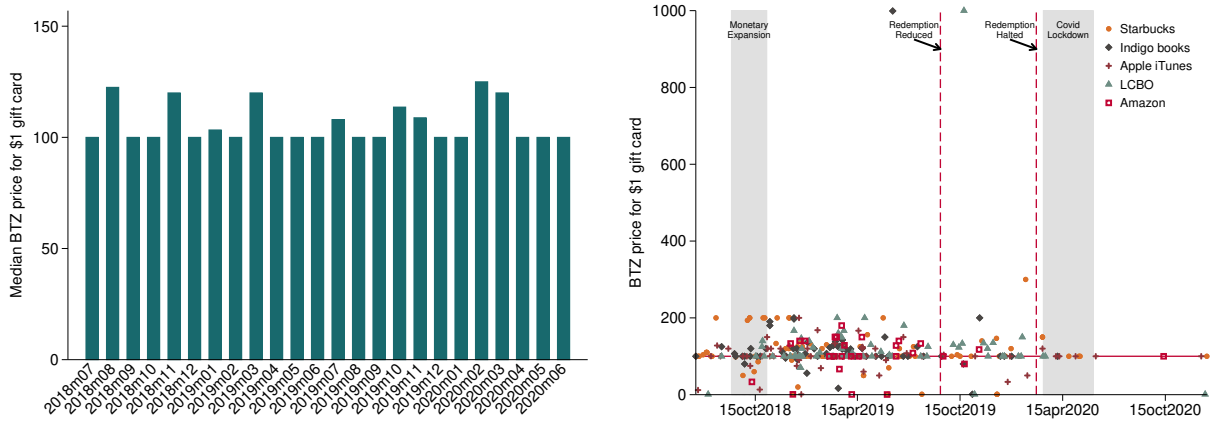
Token redemption. The level of token redemption was consistently lower than that of token issuance. The blue line in Figure 1 Panel (a) plots weekly redemption, defined as the amount of BTZ transferred from users to Shop Local stores to purchase goods. In May 2018, there was a short but sharp increase token redemption after the initial BTZ introduction. In October to December 2018, there was another wave of heightened token redemption, after the monetary expansion. However, after Christmas Day that year, BTZ redemption fell back toward its initial level. Appendix Figure A5 shows that trends in token flows are broadly similar for regular users with different transaction intensity.

Token supply. During the monetary expansion, token issuance far exceeded token redemption. As a result, token supply increased by about five times. Figure 1 Panel (b) plots the total supply of tokens in circulation, defined as the cumulative sum of BTZ issued minus the cumulative sum of BTZ redeemed. After the first wave of monetary expansion in April and May 2018, the total value of token in circulation stabilized at roughly 20 million BTZ (equivalent to 0.2 million CAD). BTZ supply grew rapidly in September 2018 due to increased token issuance, but was stabilized after November 2018 at a level of roughly 100 million BTZ (equivalent to 1 million CAD).

Figure 2: Token price, all available data

(a) Median posted token price

(b) All posted token prices



Source: The sample is all posted gift cards issued by Starbucks, Indigo books, Apple iTunes, LCBO, and Amazon with an associated BTZ value and a discernible gift card value in the post title or description. Panel (a) shows the median exchange rate for each month. Panel (b) plots every posted gift card as a dot.

4.2 Token Price, Acceptance, and Velocity

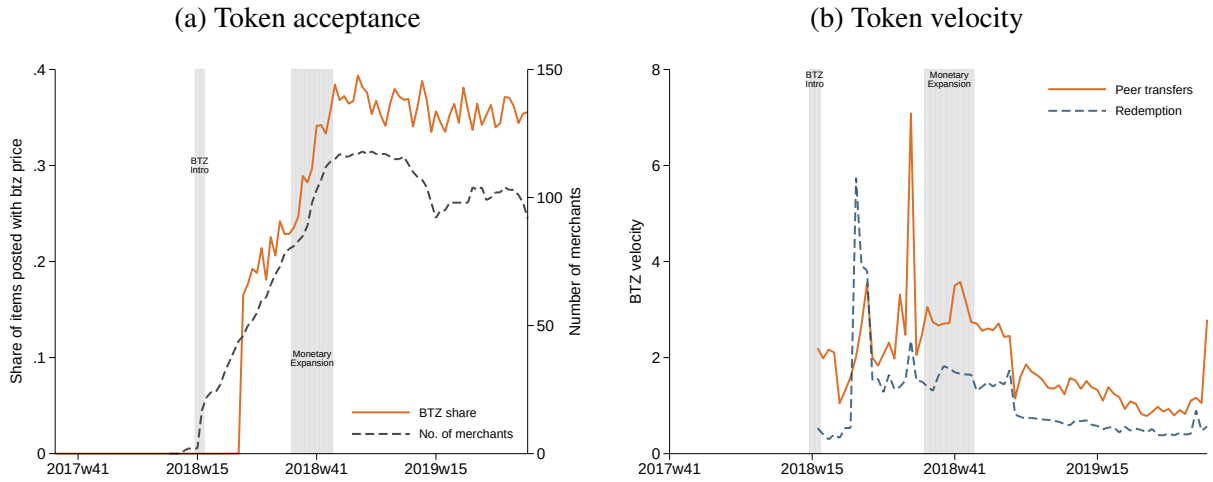
Despite the fivefold increase in token supply, there was no detectable change in token prices, acceptance, and redemption share. Instead, token velocity fell after the monetary expansion.

Token price. To measure the token price, I use item postings for store gift cards that are frequently transacted on the platform and take the ratio of their posted BTZ price and their dollar-denominated face value.[17] Since BTZ were not freely exchangeable with other currencies, but rather redeemable at a fixed exchange rate through good purchases at local stores, this measure provides the best available proxy for the BTZ token price as perceived by Bunz users.

Figure 2 show that the token price remained anchored at the fixed exchange rate of the token redemption program throughout. Panel (a) shows the median posted exchange rate for gift cards by month, which hovered unchangingly from July 2018 until June 2020 around the official fixed exchange of 100 BTZ to 1 CAD. Panel (b) plots all available relative token price from gift card posting over time. This plot shows that there was considerable dispersion in gift card exchange rates, as might be expected in an app where exchange is subject to search frictions. For a large

[17] Specifically, I focus on gift cards for five large sellers that are frequently sold in the app: Starbucks Coffee, Indigo Books and Music (a Canadian bookstore chain), Apple iTunes, LCBO (the Canadian government-run liquor retailer), and Amazon.

Figure 3: Token acceptance and velocity, before and after monetary expansion



Notes: Figure shows the weekly trend in (a) share of items post that eventually have a posted BTZ price and number of active local stores available for BTZ redemption, which have been active for at least two weeks (b) BTZ redemption and peer transfer divided by the total BTZ supply (multiplied by weeks in a year). Gray bars indicate the first and second wave of monetary expansion.

fraction of gift cards, however, the posted token prices were exactly 100 BTZ to 1 CAD, the official exchange rate for token acceptance at local stores.

Token acceptance. Figure 3 Panel (a) shows that token acceptance did not discontinuously change during the monetary expansion. To measure token acceptance, I use the share of items posted with a BTZ price, which signals the willingness of Bunz users to accept the BTZ token. This measure steadily increased from the day that users were able to post BTZ prices until the end of the monetary expansion, when it stabilized at around 35 percent. The increase in token acceptance is strongly correlated with the increasing number of redemption stores, which also stops to grow at the end of the monetary expansion. Appendix Figure A6 shows that trends in token acceptance are broadly similar for users with different transaction intensity.

Token velocity. Token velocity—the speed at which token change hands—is defined as token flows divided by token holdings. According to Prediction 1, monetary expansion reduces token velocity. Consistent with this, token velocity persistently fell roughly two months after the monetary expansion, at the end of 2018. Figure 3 Panel (b) shows that tokens changed hands between users around 3 times per year during the second half of 2018, while redemption at local stores per

available token was roughly 1.7 times per year. During the first three months of 2019, transfers and redemption per token supply fell to a lower level of 1.7 and 0.75 times per year, respectively.

Redemption share of token expenditure. Appendix Figure A9 Panel (d) shows that the share of user token expenditure used for redemption (instead of peer transfers) remained stable around 35 percent around the monetary expansion. This result confirms that monetary expansion did not significantly alter beliefs about the value of the token.

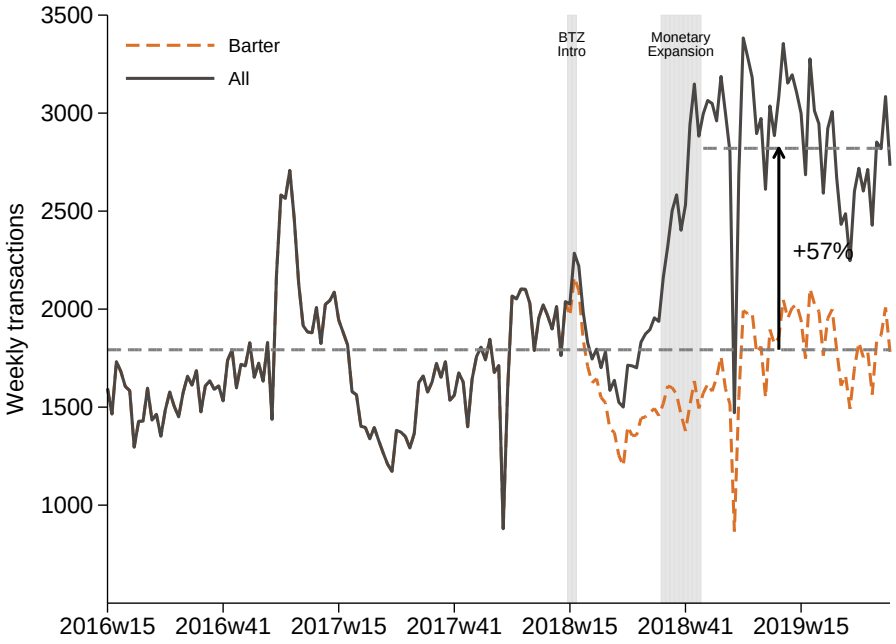
4.3 Barter and Token-mediated Transactions

Monetary expansion increased token-mediated transaction volume by 57%, but had little effect on barter volume. There was little change in the entry and exit of regular users. The increase in token-mediated transactions is instead explained by a large increase in offer messages sent and a small increase in transactions per offer.

Total transactions. To measure transaction volume, I count the number of ratings that users provide one another. This measure is the closest available proxy for the volume of goods exchanged on the bartering app, since trade occurs offline and are not directly recorded. It is also difficult to know the value of goods traded, since barter transactions are not associated with any prices, and the goods are typically used and highly heterogeneous. This measure is likely an underestimate, since users may not always provide a rating for their transaction partner upon the completion of a trade. However, it is likely to be highly predictive of the number of completed trade. Most importantly, these data are available both before and after the introduction of BTZ, whereas token transactions are only available after token introduction.

Figure 4 shows that monetary expansion dramatically increased transaction volume. In the two years before the introduction of BTZ, the total peer-to-peer transaction volume was largely stable. After the introduction of BTZ in April 2018, there was a small dip in completed transactions. This dip is likely to be driven seasonal trends, since a dip of similar magnitude is seen during the year before. After the monetary expansion in September 2018, there was a large and persistent increase in the number of transactions completed.

Figure 4: Effect of monetary expansion on transaction volume



Notes: Figure shows the weekly trend in the number of peer-to-peer transactions as measured by user reviews, decomposed by whether a token transfer occurred between the same user pair within 7 days. Gray bars indicate the first and second wave of monetary expansion.

Table 1 displays the percentage change in user activity for different subsets of users. Row (a) Column (1) shows total transactions among all users increased by 57% following monetary expansion. Column (2) shows that the increase among regular users is very similar.

Appendix Figure A7 Panel (a) plots the trend separately for regular users with different activity intensity. For all subsets, the pre-event number of transactions was stable. There were also similar increase in transaction volume following the monetary expansion.

Barter vs. token-mediated transactions. Transaction volume can be decomposed into barter and token-mediated transactions based on whether a token transfer occurred between the same pair of users within 7 days of the transaction as measured by the user ratings.

Figure 4 shows that monetary expansion did not change the overall level of barter transactions. The rise in total transaction volume is instead accounted for by the emergence of token-mediated transactions. These token-mediated trades began to emerge almost immediately following BTZ

Table 1: Percentage change in activity, before and after monetary expansion

	All users	Regular users
	(1)	(2)
(a) Total transactions	57%	57%
(b) Barter transactions	3%	2%
(c) Entry	59%	-1%
(d) Offer messages sent	41%	39%
(e) Transactions per offer	11%	14%
(f) Items posted	38%	38%
Number of users	215271	10790
Pre-event weekly transactions	1793	1489

Notes: Tables display the percentage change in user activity during the year after the monetary expansion, compared to the year before. The pre-event period is defined as week 36, 2017 to week 35, 2018 and post-event period is defined as week 36, 2018 to week 35, 2019. Entry is defined by first messages sent by users. Column (1) includes all users. Column (2) includes only regular users, who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

introduction, but substantially grew during the monetary expansion. Table 1 row (b) shows that the number of barter transactions did not meaningfully change in response to monetary expansion among regular users. Appendix Figure A7 Panel (b) confirm the trends for barter transactions were highly similar for regular users with different activity intensity.

User entry. Table 1 row (c) shows an increase in entry among all users, but little change in entry among regular users. This suggests that monetary expansion drove more users to try the platform, but these new users overwhelmingly did not become regular users who remained active on the platform. Appendix Figure A8 Panel (b) plots the trend and confirms that the entry of regular users did not visibly change around the monetary expansion. Appendix Figure A8 Panel (d) reveals that the increase in exit, as measured by the date of last message sent, among regular users was gradual and did not exhibit any trend break around the monetary expansion.

Offers sent and transactions per offer. Table 1 row (d) shows that the number of offer messages sent by users rose by 41% immediately after the monetary expansion. Since an offer message signals a buyer's interest to some seller, this finding suggests that a large increase in eagerness among users to purchase goods on the platform.

Table 1 row (e) shows that the number of transactions completed per offer message also increased by 11%. This finding suggests easier bargaining after a buyer makes an initial offer due to the monetary expansion. This increase is similar across all subsets of users.

Appendix Figure A9 Panels (a) and (b) confirm that both measures were stable prior to the monetary expansion and persistently rose during the monetary expansion.

Items posted. Table 1 row (f) shows that the number of new items posted on the platform increased after the monetary expansion. Appendix Figure A9 Panel (c) shows that the increase was gradual, suggesting that it took time for sellers to learn or adjust in response to the increased demand for goods on the platform. Appendix Figure A10 Panel (b) confirm the trends for items posted were highly similar for regular users with different activity intensity.

5 Effects of Reduced Redeemability

This section documents the effects of reduced redeemability on transaction behavior on the Bunz platform. In September 2019, a year after the monetary expansion considered in the previous section, Bunz HQ partially halted token redemption. Consistent with Prediction 2, there was no detectable effect on token prices, while reduced redeemability caused token acceptance and transaction volume to persistently decline. However, there was also retaliation against the platform itself, since user exit increased, user entry fell, and barter transactions declined.

5.1 Timeline of Events

The reduction in redeemability was prompted by cash flow difficulties. After introducing BTZ, Bunz HQ worked on developing other new features to drive user and revenue growth, including introducing a community discussion feature and selling in-app advertising. As 2019 progressed,

however, Bunz HQ's financial position became increasingly untenable. There were roughly 18 employees on its payroll, token redemption continued to drain its coffers, and its budding advertising sales were insufficient to offset the cash outflow. Though Bunz HQ worked to raise funds, it soon became clear that neither new investment nor an acquisition was forthcoming (Galang 2019).

On September 9, 2019, Bunz HQ announced that tokens would henceforth only be redeemable at local partner stores selling coffee or food. In a letter sent to Shop Local partner businesses, Bunz HQ wrote, "Effectively immediately, you will no longer be able to accept BTZ and convert them into CAD currency. We will be locking your wallets, and everyone will be paid up to September 10th inclusive" (see Appendix B.3).

Shocked and disgruntled, Shop Local partners took to announcing these changes on the app to the wider Bunz community, criticizing Bunz HQ for the abruptness of the decision, their lack of transparency, and their reneging on a promise to provide a 30-day notice of changes to the Shop Local program. One wrote, "While I respect their decision to end the program, more notice would have been nice. This was literally [zero] notice and not professional. I now have customers that can no longer support me on this platform, many who saved BTZ for months. And now their BTZ is no longer of use to them."

The next day, Bunz HQ provided an update to the broader community in a blog post. The post confirmed that it would no longer accept BTZ except at coffee shops and restaurants. Apologizing for "any inconvenience and disappointment this may have caused", the blog post went on to explain that Bunz HQ also had to make the difficult decision to lay off 15 employees that same day.[18]

Local news widely reported that users were angry that the platform reneged on its promise of redemption.[19] Many Bunz Facebook administrators also announced that they would sever their affiliation with Bunz.[20]

[18] Appendix B.4 provides the full text. The digital wallets of employees were also suddenly locked (Galang 2019).

[19] One article emphasized the disappointment of users, some of whom had been saving up their BTZ for bike repairs, records and other large purchases. For example, an administrator for several Bunz-related Facebook groups was to quoted to say that the announcement "felt like a punch in the gut," since she had amassed roughly $600 worth of BTZ, and treated her stockpile as a sort of safety net, in case she ran out of money and needed to buy something for her two-year-old son, but 'Now, it's worthless,' She said. 'He doesn't drink coffee"' (Posadzki 2019).

[20] As shown in Appendix B.5, this group renamed their Facebook groups as "PALZ", writing, "Today, we would like to reclaim our communities. We would like to bring Bunz back to what it once was. We want our groups to remember why they exist. We do not want to profit. We do not want your app sign-ups. We do not want you to buy into an online currency that will let you down."

There was tremendous uncertainty about the viability of the BTZ token in the following days. In an interview, a frequent seller of used books recounted that he stopped accepting BTZ after the announcement. He then spent down his stock of tokens at local restaurants by "eating like a king". Two weeks after, however, he realized that BTZ now traded among users at a discount. Since Bunz HQ still redeemed tokens at restaurants, this made it profitable for him to accept BTZ again. As of October 18, 2019, he was willing to accept BTZ at a 10-15% discount in exchange for books, but would immediately redeem the tokens for food at token-accepting stores. This way he kept only a small balance of tokens and minimized his exposure to the risk that the token might eventually become worthless.[21]

5.2 Token Redemption and Supply

The data confirm that redemption immediately spiked after redeemability was reduced. However, the magnitude of this spike in redemption was small relative to the token supply.

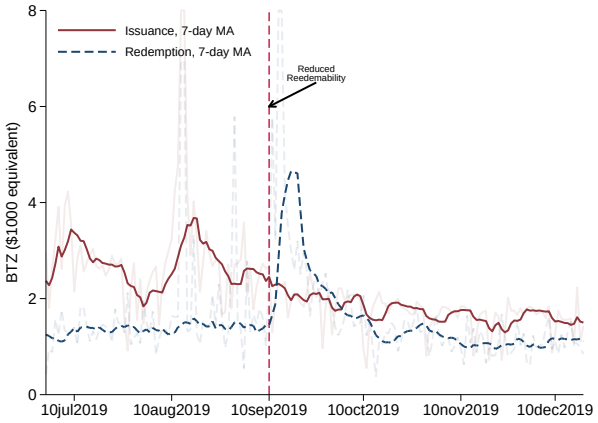
Token redemption. The light lines in Figure 5 Panel (a) that there were two instances of unusual redemption activity by a small number of users at a single redemption store in the weeks *before* the announcement by Bunz HQ to reduced redeemability. The spike in BTZ issuance and redemption on August 13 and 14 reflects fraudulent activity wherein some user created numerous accounts and then immediately redeemed these BTZ through some Shop Local store. The data show a sudden increase in new user sign-ups and referrals, which were rewarded by Bunz HQ with 1000 BTZ and 500 BTZ, respectively. The spike on August 30 is due to a large redemption of 304778 BTZ by a single user. According to Bunz's CEO, this behavior contributed to the platform's decision to prevent a larger run by reducing redeemability.

The dark lines in Figure 5 Panel (a) remove the unusual activity and display 7-day moving averages. After the reduction in redeemability on September 10, there was an immediate increase in BTZ redemption that lasted several days. This increase was neither specific to a small number of stores nor a small number of users. BTZ redemption continued to be elevated above the pre-event level for almost two weeks. Overall, the level of token redemption decline by 31% after

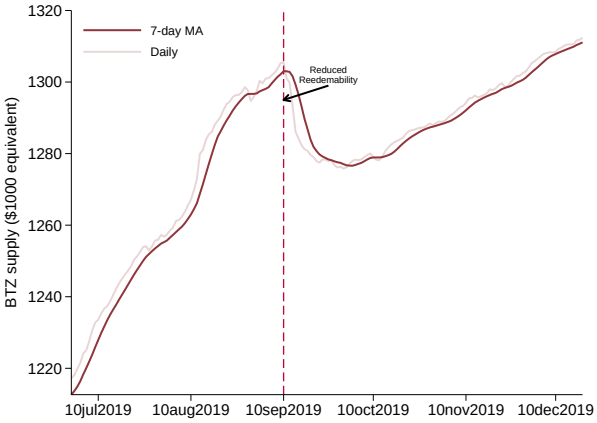
[21] Appendix B.8 provide the transcript of this interview.

Figure 5: Token supply, before and after reduced redeemability

(a) Token issuance and redemption



(b) Token supply



Notes: Panel (a) shows the trend in BTZ issuance, the total amount of tokens sent from Bunz directly to users, and BTZ redemption, total amount of tokens sent from users to local stores. Panel (b) shows BTZ supply, the cumulative sum of BTZ issued minus the cumulative sum of BTZ redeemed. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates September 10, the day of partial cessation of Shop Local program. The pre-crisis spikes in issuance and redemption reflect unusual activity by a small number of users (see text for details). In dark lines, we conduct 3 procedures to remove unusual activity: (1) remove users who received sign-up bonus on the spikes and only made redemptions on the spikes (2) remove stores cooperating with these users on and only on the spikes (3) 0.1% winsorization to remove extreme values.

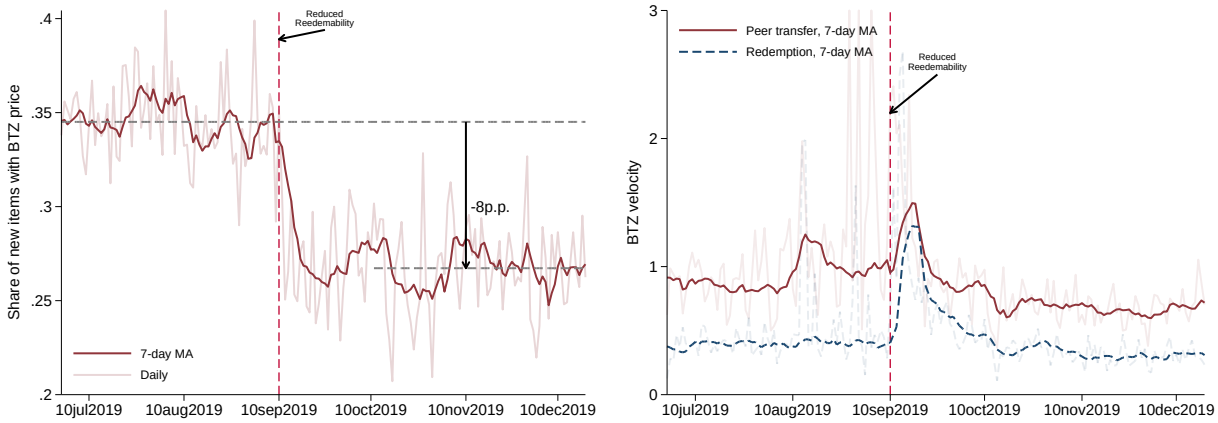
reduced redeemability, but fell only by 1% among regular users. Appendix Figure A11 Panel (b) shows regular users with greater activity intensity experienced the greatest proportional increase in redemption during the month following the reduction in redeemability.

Token supply. Figure 5 Panel (b) shows that there was only a small reduction in the token supply, in nominal value, despite the spike in redemption. Before redeemability was reduced, token issuance exceeded redemption, so token supply was steadily increasing. Immediately after, token redemption spiked, while token issuance remained similar, so token supply fell. The magnitude of the spike was small relative to the total token supply. The increase in redemption may have been limited because token redemption was now restricted to small-value and perishable items at coffee shops and restaurants.

Figure 6: Token acceptance and velocity, before and after reduced redeemability

(a) Token acceptance

(b) Token velocity



Notes: This set of figures shows the trend in (a) the share of new items with a posted BTZ price, and (b) BTZ redemption and peer transfer divided by the total BTZ supply. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates September 10, the day of partial cessation of Shop Local program. The pre-crisis spikes in token velocity of peer transfer and redemption reflect unusual activity by a small number of users (see text for details). In dark lines, we conduct 3 procedures to remove unusual activity: (1) remove users who received sign-up bonus on the spikes and only made redemptions on the spikes (2) remove stores cooperating with these users on and only on the spikes (3) 0.1% winsorization to remove extreme values.

5.3 Token Acceptance and Velocity

Despite reduced redeemability, there was no detectable change in token prices, as previously shown in Figure 2. Instead, there was a sharp reduction in token acceptance and an eventual reduction in velocity after some initial increase.

Token acceptance. Figure 6 Panel (a) shows that token acceptance immediately fell after redeemability was reduced. During the two months before the announcement, the share of new items with a posted BTZ price hovered around 35 percent. Immediately after the announcement, the share plunged to roughly 27 percent.[22] Appendix Figure A12 shows that the magnitude of the reduction in token acceptance are highly similar for regular users with different transaction frequency.

[22] Appendix B.6 provides documentary evidence of reluctance to accept the token from the Bunz platform. One users wrote that "I don't accept BTZ anymore due to uncertainty. I believe BTZ & BUNZ will cease to exist shortly." Another wrote, "I'm paused on BTZ for now, until we get some stability." Yet another wrote, "I will only be doing TRUE TRADES from now on. I no longer believe that BTZ is a sustainable form of currency because of the lack of choices that the users have, and the fluctuating rate at which they are rewarded."

Token velocity. The light lines in Figure 6 Panel (b) show that the velocity at which token changed hands between users and were redeemed experienced unusual spikes prior to the reduction in redeemability. These spikes are attributable to unusual activity by a small number of users, who likely had insider information. The dark lines in Figure 6 Panel (b) remove unusual activity by a small number of users. This cleaned series shows that there was an increase in token velocity after redeemability was reduced, attributable to a large number of users attempting to reduce their token balances. A month after the redemption halt, however, peer-to-peer and redemption token velocities both fell to steady-state levels that were lower than the initial levels.

5.4 Barter and Token-mediated Transactions

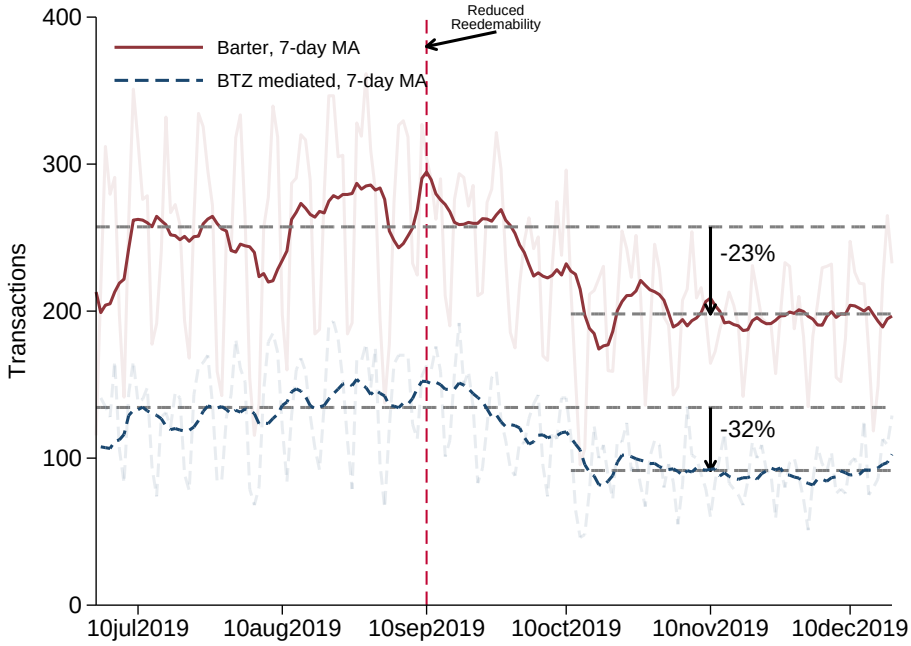
The reduction in redeemability led to a decline in token-mediated transaction volume, as expected. Contrary to Prediction 2, however, barter transaction volume also sharply fell. User entry fell, while exit increased. Offer messages sent and transactions per offer both fell. The number of items posted also fell. These findings suggest that participants reduced their use of not only the BTZ token, but also the Bunz platform altogether.

Token-mediated and barter transactions. The red line in Figure 7 shows that token-mediated transactions fell by 32% after redeemability was reduced. Before the announcement, the number of token-mediated peer-to-peer transactions, as measured by user ratings associated with a concurrent token transfer, was largely stable. After the announcement, it began to decline gradually, falling to a lower but stable level one month after the announcement.

The blue line in Figure 7 shows that barter transactions also fell by 23%. The number of barter transactions was largely stable prior to the reduction in redeemability. Immediately after the announcement, the number began to fall with a clear trend break around the date of the announcement, stabilizing at lower level roughly a month later.

Table 2 rows (c) and (d) and Appendix Figure A13 confirm that the declines in barter and token-mediated transactions are highly similar for various subsets of regular users.

Figure 7: Barter and token-mediated transactions, before and after reduced redeemability



Notes: Figure shows the trend in the number of transactions decomposed by whether a token transfer occurred between the same user pair within 7 days. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates September 10, the day of partial cessation of Shop Local program.

User entry. Table 2 row (e) shows that the entry of all users and regular users both persistently fell after redeemability was reduced. Appendix Figure A14 Panels (a) confirm a lack of confounding pre-event trends.

Offers sent and transactions per offer. Table 2 row (f) shows that the number of offer messages sent on the platform fell by 15% immediately after redeemability reduction. Appendix Figure A15 Panel (a) shows a mild upward pre-event trend, so the causal effect of reduced redeemability on the number of offers sent is likely to be somewhat larger. Offers sent also briefly increased during the week after redeemability was reduced, suggesting that users tried to reduce their token holdings. Appendix Figure A16 Panel (a) shows that the reduction in offer messages sent was highly similar for regular users with different activity intensity.

Table 2 row (g) shows that transactions per offer fell by 12%. This finding suggests bargaining after an initial offer was sent became more difficult. Appendix Figure A15 Panel (b) shows no

Table 2: Percentage change in activity, before and after reduced redeemability

	All users	Regular users
	(1)	(2)
(a) Token acceptance	-23%	-22%
(b) Token redemption	-31%	-1%
(c) Token-mediated transactions	-32%	-28%
(d) Barter transactions	-23%	-21%
(e) Entry	-61%	-56%
(f) Offer messages sent	-15%	-11%
(g) Transactions per offer	-12%	-13%
(h) Items posted	-29%	-23%
Number of users	215271	10790
Pre-event weekly transactions	2742	2218

Notes: Tables display the percentage change in user activity after redeemability was reduced. The pre-event period is defined as July 1 to September 9, 2019 and post-event period is defined as October 10 to December 19, 2019. Entry is defined by first messages sent by users. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

trend in transactions per offer prior to the reduction in redeemability.

Items posted. Table 2 row (h) shows that the number of new items posted on the platform sharply and persistently fell after redeemability was reduced. Appendix Figure A15 Panel (c) shows that the increase was immediate, suggesting that sellers quickly learned to reduce their supply of goods to the Bunz economy. Appendix Figure A16 Panel (b) confirm the reduction in items posted was highly similar for regular users with different activity intensity.

6 Effects of Redemption Halt

This section documents the effects of the complete halting of redemption by Bunz HQ on transaction behavior. Unlike the previous reduction in redeemability, the platform said that the halt

in redeemability was due to technical difficulties and would be temporary, even though redemption was never resumed. Consistent with Prediction 2, there was an immediate reduction in token acceptance and a more gradual reduction token-mediated exchange. However, there was no reduction in barter exchange, suggesting much less coordinated retaliation against the platform than the previous reduction in redeemability.

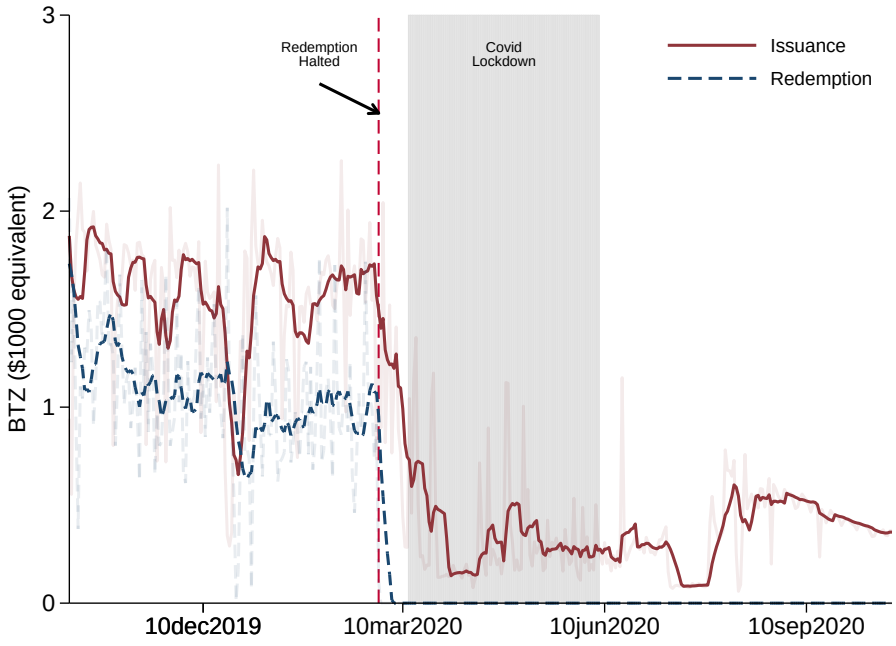
6.1 Timeline of Events

The final halt to redemption was prompted by continued cash flow difficulties. Even with its scaled down Shop Local program, Bunz HQ continued to suffer cash outlays from token redemption. Having laid off almost all of its employees, Bunz's CEO departed from the company and only one employee, the Bunz community manager, remained. Management of the app was transferred to one of the company's investors, who continued to operate the app by selling in-app digital advertising.

The pause to the Shop Local program was announced on February 28, 2020. The pause was promised to be "temporary." During this time, the platform would address "the gaming of BTZ rewards" by "implementing additional checks and controls, which [they] will communicate out once those controls are in place" (See Appendix B.7). It is likely that this wording was carefully chosen to avoid the backlash and bad publicity when Bunz HQ partially halted redemption. The Shop Local program was never restarted thereafter.

Measurement of the long-run impact of redemption halt is complicated by the arrival of the Covid-19 pandemic two weeks later. On March 12, Ontario Premier Doug Ford announced that publicly funded schools across the province will be closed for two weeks following March break. Prior to that date, public transit usage in Toronto had not deviated from normal levels. Immediately after, public transit usage began to fall and reached 60% below baseline within five days. On March 17, Ford declared a state of emergency in Ontario and orders business including daycares, bars and restaurants, theatres and private schools to be closed. In late April, Covid-related deaths peaked. In mid-May, relaxation of stringent social distancing rules and business closures gradually began. The high-frequency nature of the data enables me to distinguish between the effect of redemption halt from the effects of the Covid-19 pandemic.

Figure 8: Token issuance and redemption, before and after redemption halt



Notes: Figure shows the trend in BTZ issuance, the total amount of tokens sent from Bunz directly to users, and BTZ redemption, total amount of tokens sent from users to local stores. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates February 28, the day of full cessation of Shop Local program

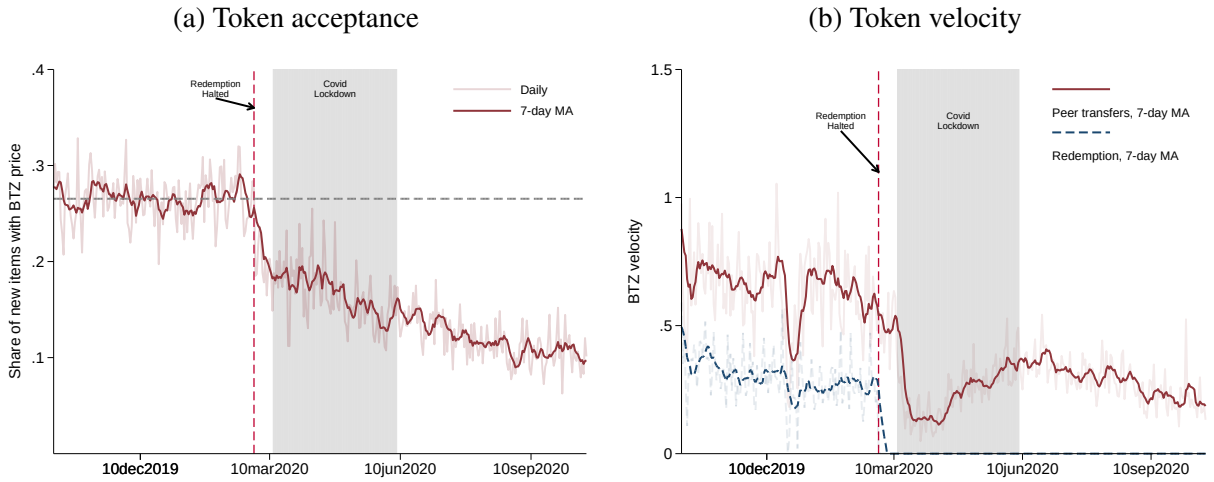
6.2 Token Price, Acceptance, and Velocity

The data confirm that the redemption halt led to an immediate and permanent fall in redemption and acceptance. There was no detectable change in token price.

Token supply. Figure 8 shows that after the redemption halt, token redemption immediately and persistently dropped to zero. Token issuance also dropped immediately, indicating that users were much less likely to answer the "Daily BTZ Drop" surveys or take other actions on the platforms that were rewarded users with tokens.

Token price. Figure 2 shows no detectable change in token prices even after redemption was halted. However, few observations of the token price are available beyond the first few month after redemption was halted, since the number of gift cards posted dwindled after the redemption halt.

Figure 9: Token acceptance and velocity, before and after redemption halt



Notes: Figure shows the trend in (a) the share of new items with a posted BTZ price, and (b) BTZ redemption and peer transfer divided by the total BTZ supply. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates February 28, the day of full cessation of Shop Local program.

Token acceptance. Figure 9 Panel (a) shows that token acceptance immediately fell after redeemability was halted. The share of new items with a posted BTZ price hovered around 26 percent during the two months before the halt. After the halt, the share immediately plunged to roughly 17 percent. Thereafter, the share continued to slowly slide downward without any interruption from Covid-19. By the end of 2020, only about 10 percent of item posts had a BTZ price.[23] Appendix Figure A17 confirms that the decline in token acceptance is highly similar for regular users with different transaction intensities.

Token velocity. Figure 9 Panel (b) shows that token velocity gradually fell after redemption was halted. Initially, there was little detectable effect. There was then a sharp drop in velocity upon the arrival of the Covid-19 pandemic, two weeks later. However, token velocity increased as the lockdown ended, before it gradually fell again. Appendix Figure A18 shows that the trends in token issuance, redemption, inflows, and outflows was similar for regular users with different transaction intensities.

[23] As of June 2021, it was exceedingly rare for items to still be posted with a BTZ price. Once while using the app, I encountered a user who was willing to accept BTZ in exchange for a used book. But upon further inquiry, I learned that this was because he had hoped to give the item to someone who could use it, since "BTZ right now has $0 value."

Figure 10: Barter and token-mediated transactions, before and after redemption halt

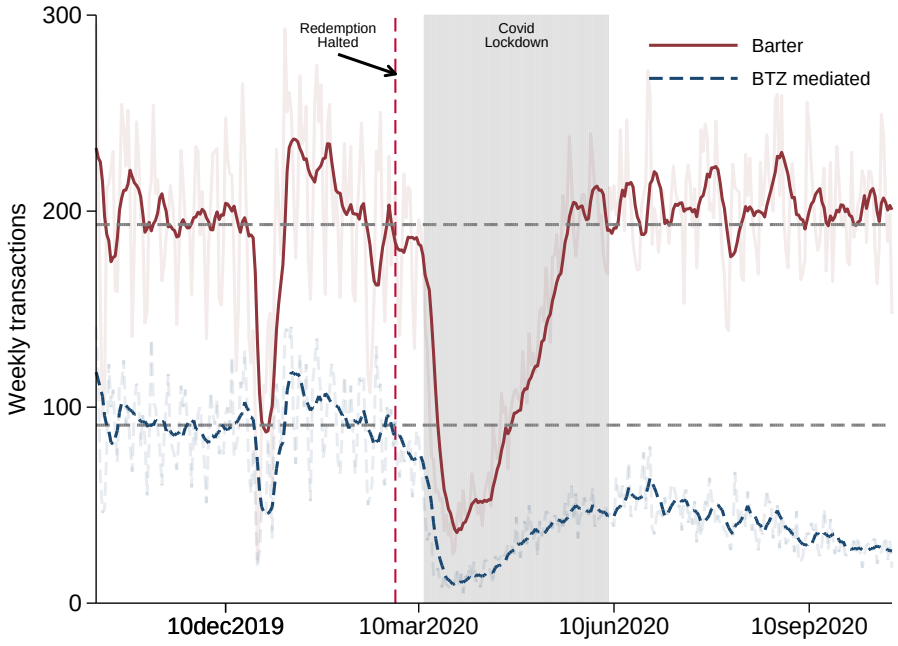


Figure shows the daily trend in the number of peer-to-peer transactions as measured by user reviews, decomposed by whether a token transfer occurred between the same user pair within 7 days. Gray bars indicate the period within covid lockdown. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates February 28, the day of full cessation of Shop Local program.

6.3 Barter and Token-mediated Transactions

Redemption halt was followed by reduced token-mediated transaction volume and little change in barter transaction volume. While offer messages fell, there was little change in user entry and exit, transactions per offer message, or goods supply. Unlike the first reduction in redeemability, the negative effects of redemption halt were contained to token-mediated exchange.

Token-mediated and barter transactions. The blue line in Figure 10 shows a gradual decline in token-mediated transactions in the months following the redemption halt. This gradual decline were interrupted by the arrival of Covid, which led transactions to be depressed until Covid restrictions were lifted. In June, after Covid had passed, token-mediated transactions were roughly two-third of the level prior to the full halting of redemption. By the end of 2020, it was only one-third of the pre-halt level.

Table 3: Percentage change in activity, before and after redemption halt

	All users	Regular users
	(1)	(2)
(a) Token acceptance	-57%	-57%
(b) Token-mediated transactions	-58%	-57%
(c) Barter transactions	5%	5%
(d) Entry	-47%	-6%
(e) Offer messages sent	-14%	-13%
(f) Transactions per offer	-1%	-3%
(g) Items posted	-2%	-2%
Number of users	215271	10790
Pre-event weekly transactions	1988	1670

Notes: Tables display the percentage change in user activity after redemption was halted. The pre-event period is defined as October 10, 2019 to February 27, 2020 and post-event period is defined as July 1 to October 19, 2020. The week spanning Christmas Eve and the period under covid lockdown are excluded from calculation. Entry is defined by first messages sent by users. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

The red line in Figure 10, however, shows little change in barter transactions as a result of halted redemption. When Covid restrictions lifted in May 2020, barter transactions essentially returned to the same of the level prior to the full halting of redemption and remained highly stable. This result contrasts with our findings in Section 5, which shows that barter transaction sharply fell after the initial reduction in redeemability.

Table 3 rows (b) and (c) show that the declines in barter and token-mediated transactions are highly similar for regular users with different transaction intensities (see also Appendix Figure A19).

User entry. Table 3 row (d) shows that the entry of all users fell by 47%, but the entry of regular users did not significantly change after redemption was halted. Appendix Figure A20 Panels (a) and (b) confirm that entry was stable during the months prior to the halt.

Offers sent and transactions per offer. Table 3 row (e) shows that number of offer messages sent on the platform fell by 14% after the halt in redemption (excluding the period impacted by the Covid-19 lockdown). By contrast, row (f) shows that transactions per offer message sent did not fall. Appendix Figure A21 Panel (a) and (b) show no trend in either offer messages sent or transactions per offer prior to the halt in redemption.

Items posted. Table 3 row (g) shows that the number of new items posted on the platform did not significantly change after the redemption halt. Appendix Figure A21 Panel (c) confirms the absence of pre-trends. Appendix Figure A22 shows that the reduction in items posted was similar for regular users with different transaction intensities.

7 Discussion

This paper is the first to assess the empirical validity of different models of money as a medium of exchange using detailed and high-frequency data on barter and monetized transactions from the field. The unique data cover the rise and fall of a digital currency in an entire barter economy. They span several large and unexpected monetary experiments, including a large monetary expansion and two sudden reductions in token redeemability. With interrupted time-series designs, the data and experiments allow me to test the assumption and predictions of New Monetarist models.

The main findings of this paper confirm the predictions of a New Monetarist model of redeemable money with price rigidity. Consistent with the model's assumption, posted token prices did not meaningfully change in the Bunz barter economy despite a dramatic increase in token supply and two large reductions in token redeemability. Moreover, as predicted by the framework, monetary expansion caused a substantial and persistent increase in token-mediated transactions and was followed by an eventual reduction in token velocity. Reductions in redeemability reduced token acceptance, token velocity, and token-mediated transactions.

The above findings are quasi-experimental field evidence that money overcomes the inefficiencies of barter. However, they are not fully consistent with a large class of New Monetarist theories, including the workhorse Lagos-Wright (2005) model. Specifically, the data reveal important roles for redeemability and price coordination frictions. In addition, auxiliary findings suggest roles

for partial money acceptance, endogenous search and redemption behavior, as well as community enforcement of redemption promises. Each inconsistency is discussed below.

Partial acceptability. First, I find that even at the height of BTZ token usage, only roughly a third of Bunz users accepted tokens. Moreover, changes in redeemability had significant impacts on the degree of acceptability. However, in contrast to the clear importance of partial acceptability in the Bunz economy, the possibility of partial acceptability is largely ignored in New Monetarist literature except in first-generation models. Kiyotaki and Wright (1993) derive an equilibrium with partial acceptance. Wright (1999) shows that this equilibrium is not robust to perturbations. Shevchenko and Wright (2004) show that partial acceptability can robustly arise when individual-level heterogeneity is incorporated into the Kiyotaki-Wright (1993) model. However, there is very little subsequent work on partial acceptability. In the Lagos-Wright (2005) framework, there are only equilibria where agents either all accept or all do not.

Endogenous search behavior. Second, I find that Bunz users endogenously chose whether to use the platform, post items, and spend time browsing and searching in the Bunz app. In response to monetary events, all of these margins responded. By contrast, the New Monetarist literature largely assumes that there is a fixed population engaging in barter and that the rates at which agents produce commodities and meet are exogenous. Incorporating these additional margins of response would lead to increased realism and applicability of New Monetarist models.[24]

Redeemability and endogenous redemption. Third, I find an essential role for redeemability in sustaining currency acceptance, as well as a role for endogenous redemption choices in determining money balances. The first reduction in redeemability not only caused a reduction in token

[24]For example, to model entry, it can be assumed that each agent i faces an entry cost k_i and they must wait to receive money after entry. In steady-state equilibrium, all agents with value $V_{i0} \geq k_i$ enter. If money supply expands, then V_{i0} increases, so agents enter the barter economy. If redemption availability falls, then V_{i0} falls and fewer agents remain. Endogenous item posting can be incorporated into the model above by assuming that production requires time, as in Kiyotaki and Wright (1993), and that production time falls with effort whose cost is convex and increasing. Matching probabilities may also be endogenized by assuming that match rates increase with the number of items on the platform. Monetary expansion then increases the number of agents on the platform, the rates at which items are produced and agents meet, and the likelihood of transaction upon meeting. By contrast, reduced redeemability would cause a decline in all of these variables.

acceptance, it also caused a temporary increase in redemption, suggesting that some agents endogenously chose to redeem to spend down their token holdings. Related models have added banks that redeem deposits to the Lagos-Wright (2005) framework (e.g. Berentsen, Camera and Waller 2007; Gu et al. 2023). However, to my knowledge, there are no prior New Monetarist models that explore the effects of exogenous changes to redeemability. The conceptual framework developed in this paper makes some limited progress towards filling this gap. To match the observed dynamic response in redemption volume, it is necessary to develop a model where redemption choices are endogenous.

Community enforcement of redemption promises. Fourth, I find that the first instance of reduced redeemability, which was heavily criticized in the press by aggrieved users and damaged the reputation of the platform, not only reduce monetized trade, but also reduced entry and barter transactions. However, the second instance, which was promised to be temporary and received much less public attention, had little effect on entry or barter. These findings are not easily explained in models that feature only search frictions. However, they can be explained by incorporating moral hazard and community enforcement. For instance, one might relax the assumption that the platform always honors its promises to redeem tokens, and posit that the community at large provides dynamic incentives for the platform to honor on its promise to redeem tokens through the threat of coordinated punishment.[25] This finding is related to institutionalist views that highlight the presence of social contracts and the proper governance of credit originators in the operation of monetary systems (Graeber 2011; Schnabel and Shin 2018; Borio 2019; Gorton and Zhang 2021).

Price coordination frictions. Finally, I find that in response to a halt in token redemption, token prices did not move at all. This finding is difficult to rationalize in a large class of New Monetarist models with Walrasian money markets, where the price level quickly adjusts to equate money supply and demand.[26] It is instead best explained by New Monetarist models with divisible money

[25]For example, the platform may earn rents from seigniorage, transaction fees, or advertising sales. If the platform reneges on its promise, agents may punish the platform by leaving or tarnishing its reputation. The fear of retaliation encourages the platform to prudently manage its finances so that its obligations are met, which in turn allows agents to trust the platform.

[26]One subclass of such models features agents who lack double coincidence of wants trading in Walrasian submarkets (Samuelson 1958; Townsend 1980; Tirole 1985; Banerjee and Maskin 1996; Kiyotaki and Moore 2002).

and indivisible goods, in which price coordination difficulties can arise (Green and Zhou 1998, 2002; Zhou 1999, 2003; Kamiya and Sato 2004; Kamiya, Morishita and Shimizu 2005; Kamiya and Shimizu 2006, 2007*a*,*b*, 2011; Rabinovich 2017; Kamiya et al. 2021). For example, Green and Zhou (1998) show that when buyers trade indivisible goods with price posting and random search, there exists an indeterminacy of monetary steady state. Jean, Rabinovich and Wright (2010) extends this result to a setting with indivisible goods and a regular centralized market where buyers and sellers simultaneously choose money holdings and prices. Han et al. (2016) show that equilibrium determinacy is restored in models with indivisible goods and either competitive search or efficient bargaining.

Implications for New Monetarist economics. One general lesson from this study is that New Monetarist models are highly useful for interpreting high-frequency transaction-level field evidence regarding the microstructure of money and barter. To date, empirical applications of New Monetarist models have often focused on calibration to match macroeconomic trends. However, New Monetarist models have myriad implications about micro-level details regarding the conduct of exchange, which are generally absent in macroeconomic data. Greater attention to microdata from the field may therefore prove valuable for informing, disciplining, and advancing the New Monetarist research agenda.

Another important lesson is that the available field evidence is not easily reconciled with the workhorse Lagos-Wright (2005) framework. It is undeniable that the theoretical innovations of Lagos and Wright (2005) have vastly increased the tractability of New Monetarist models of divisible money. However, its assumption of universal acceptance of non-redeemable fiat money is not compatible with the Bunz evidence. To fit the Bunz data, a tractable variant with redemption, partial acceptance, and price coordination frictions is needed. The development of such models can increase the applicability of New Monetarist theory and is left for future work.

These models emphasize the role of money either as an inter-generational store of value (Samuelson 1958; Tirole 1985), in overcoming spatial separation (Townsend 1980), in overcoming limited commitment (Kiyotaki and Moore 2002), or in overcoming private information (Banerjee and Maskin 1996). Another considers agents who trade in both decentralized and centralized markets, where the lack of double coincidence exists only in the decentralized market (e.g., Shi 1997; Lagos and Wright 2005; Rocheteau and Wright 2005; Menzio, Shi and Sun 2013). In these models, prices flexibly adjust to equate money supply and demand.

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Appendix

A Additional Tables and Figures

Figure A1: Illustration of token and goods flow in the Bunz economy

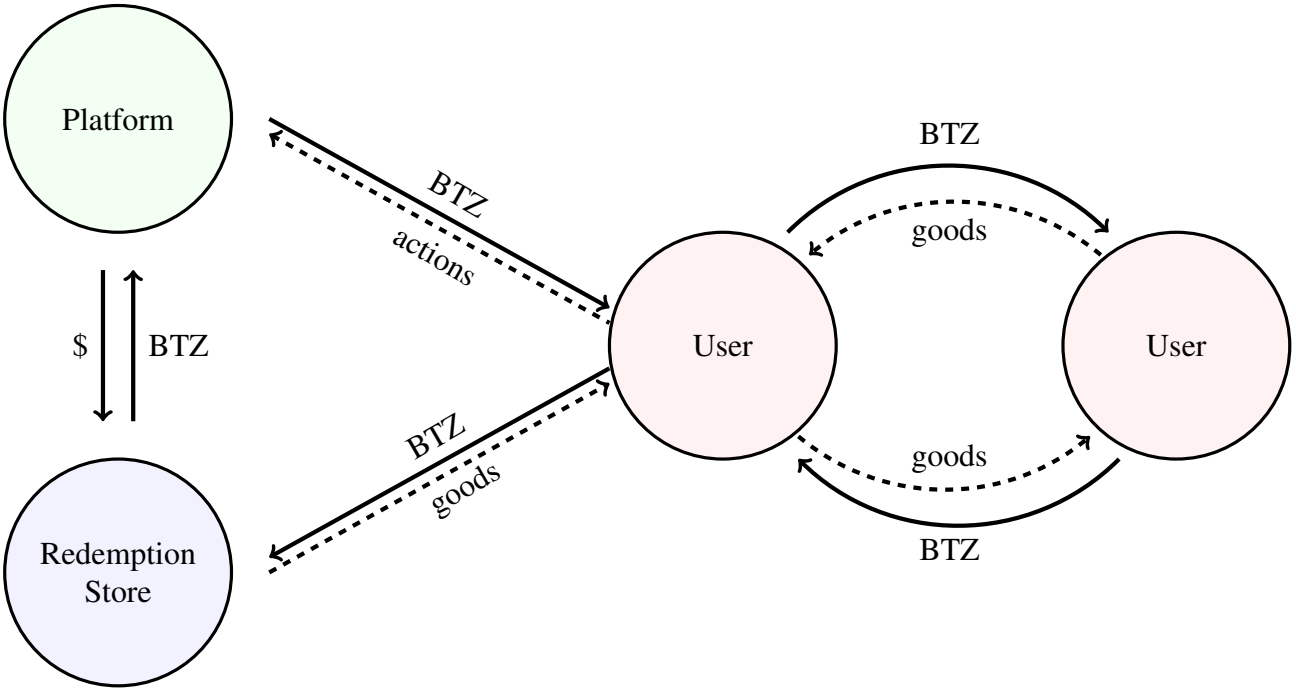
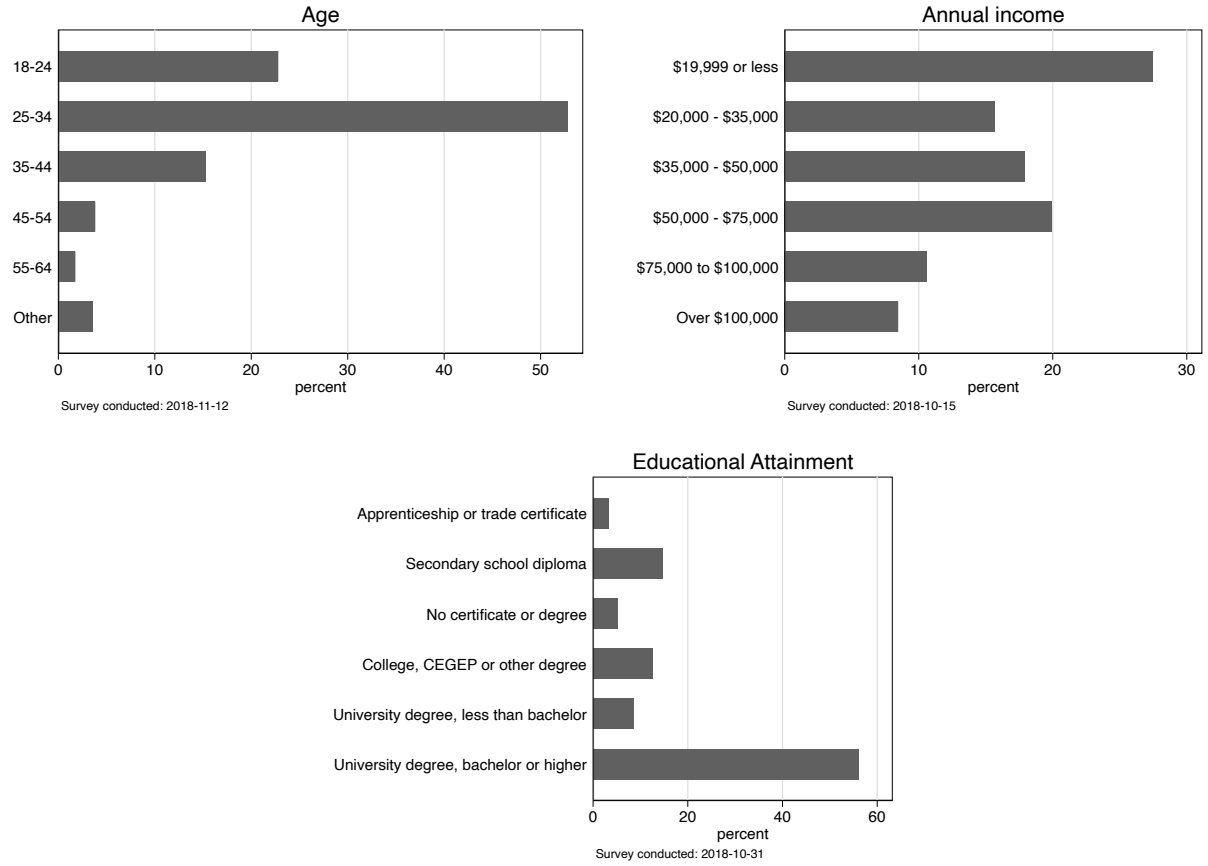


Figure A2: User demographics: Survey responses



Source: User response from BTZ drop survey.

Table A1: Summary statistics, item posted, by category

Category	Items	Share with	BTZ price (CAD)		
	(% of total)	BTZ price	p10	p50	p90
Clothing (uncategorized)	11.0%	38.8%	3	10	40
Jewelry	9.9%	37.1%	2	9	40
Home	9.5%	33.3%	2	10	40
Women's clothing	9.4%	39.7%	4	10	40
Grocery	5.7%	33.2%	1.5	6.5	25
Beauty	4.2%	39.1%	2	9.5	32
Electronics	3.4%	34.7%	2	11	85
Books	3.3%	31.0%	1.5	5	20
Health	3.3%	35.8%	1.5	6	25
Footwear	3.0%	36.3%	4.5	15	60
Toys and baby	2.4%	36.7%	2	8.5	30
Art/handmade	2.1%	37.4%	2	10	50
Plants	1.9%	37.6%	2.5	8	25
Music	1.3%	34.6%	2	10	50
Men's clothing	0.8%	38.6%	4	15	60
Movies	0.6%	35.2%	1	5	25
Video games	0.6%	34.0%	4	15	90
Gift cards	0.6%	21.9%	7.5	28.8	100
Pets	0.5%	32.7%	2	8	35
Uncategorized	26.5%	31.9%	1.5	8	40
Total Items	1129440				

Notes: This table displays all items posted by users on the Bunz platform between September 1, 2018 and August 31, 2019. All BTZ numbers are denominated in the Canadian dollar (CAD) at the fixed exchange rate: 1 CAD = 100 BTZ.

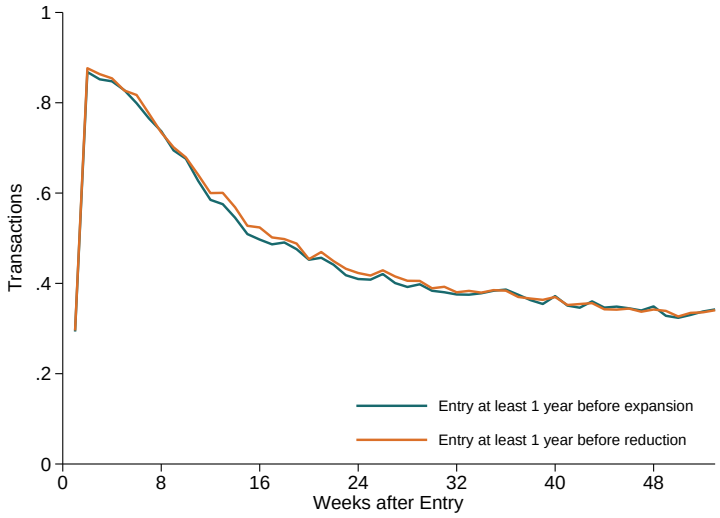
Table A2: Total monthly activity, all and regular users

	All users	Regular users	Percentage
	(1)	(2)	(3)
Transactions	12202	10129	83%
Barter transactions	7525	6163	81.9%
Token-mediated transactions	4676	3966	84.8%
Items posted	95212	66728	70.1%
Token acceptance	.35	.38	
Offer messages sent	175521	134676	76.7%
Offer messages received	175655	115674	65.9%
BTZ flows			
Issuance	150260	50908	33.9%
Redemption	72004	37354	51.9%
Transfer from peer	143955	102665	71.3%
Transfer to peer	143955	98035	68.1%
BTZ volume per flow			
Issuance	.32	.24	
Redemption	17.18	21.77	
Transfer from peer	15.1	14.76	
Transfer to peer	15.1	15.5	
Number of users	120737	9652	8%

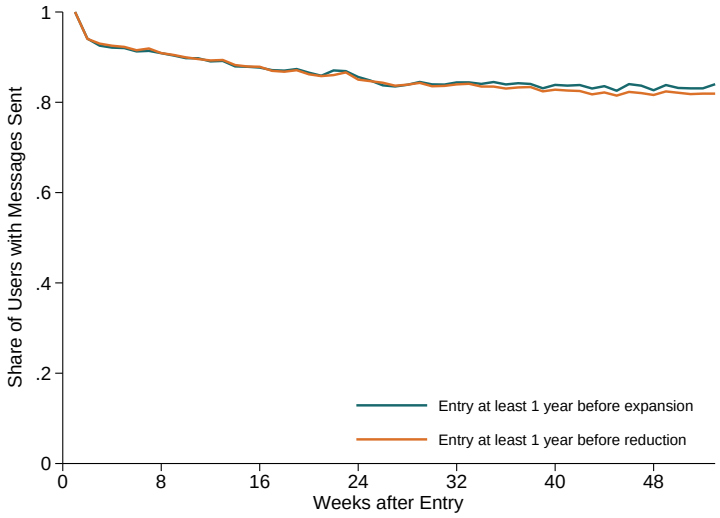
Notes: This table displays total monthly activity, averaged between September 2018 and August 2019, for all and regular users. All BTZ numbers are denominated in the Canadian dollar (CAD) at the fixed exchange rate: 1 CAD = 100 BTZ. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

Figure A3: User activeness, by week after entry

(a) Transactions



(b) Any message sent



Notes: Figure shows the weekly trend after entries for users who entered at least 1 year before expansion/reduction in (a) total transactions per week and (b) share of users with messages sent.

Table A3: Summary statistics: regular users, decomposed by user transaction intensity

	10-49	50-99	100-199	200+
	(1)	(2)	(3)	(4)
Barter share of transactions	.61	.6	.6	.6
Token-mediated share of transactions	.39	.4	.4	.4
Items posted per transaction	7.09	6.24	5.92	5.08
Token acceptance	.37	.41	.43	.4
Offer messages sent per transaction	13.05	11.85	13.67	12.89
Offer messages received per transaction	12.2	10.55	9.59	7.25
Number of BTZ flows per transaction				
Issuance	5.84	4.27	3.41	2.2
Redemption	4.26	3.24	3.46	1.97
Transfer from peer	10.86	9.73	10.82	8.32
Transfer to peer	10.34	9.02	10.06	8.08
BTZ volume per flow				
Issuance	.23	.24	.25	.24
Redemption	20.78	22.07	29.51	21.13
Transfer from peer	14.51	14.34	15.97	15.59
Transfer to peer	15.73	14.73	16.64	15.09
Number of users	3686	1192	520	167

Notes: This table displays the average of different activity volumes between September 2018 and August 2019 for regular users separately grouped by their lifetime transactions as measured by total ratings received between 13jan2016 and 19nov2021. All BTZ numbers are denominated in the Canadian dollar (CAD) at the fixed exchange rate: 1 CAD = 100 BTZ. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

Figure A4: Illustration of state transitions in conceptual framework

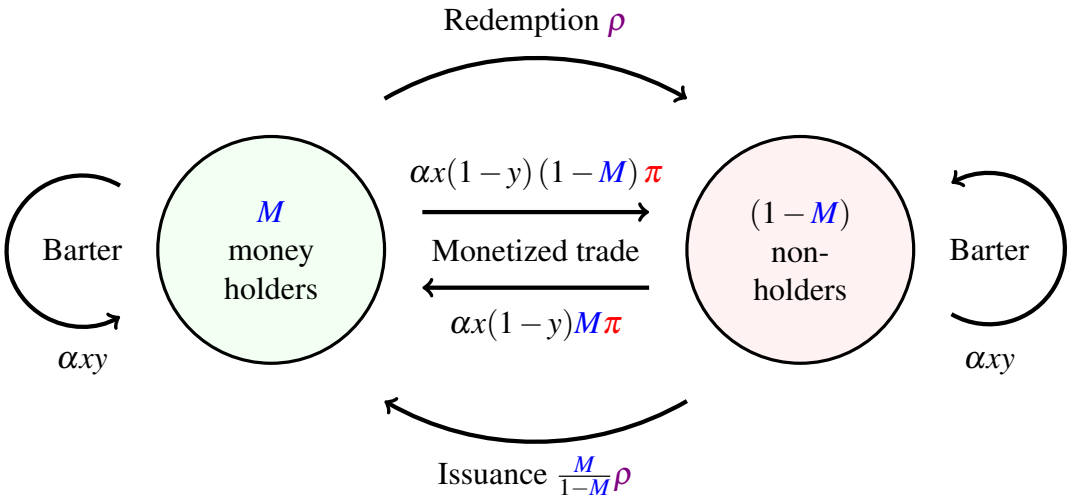
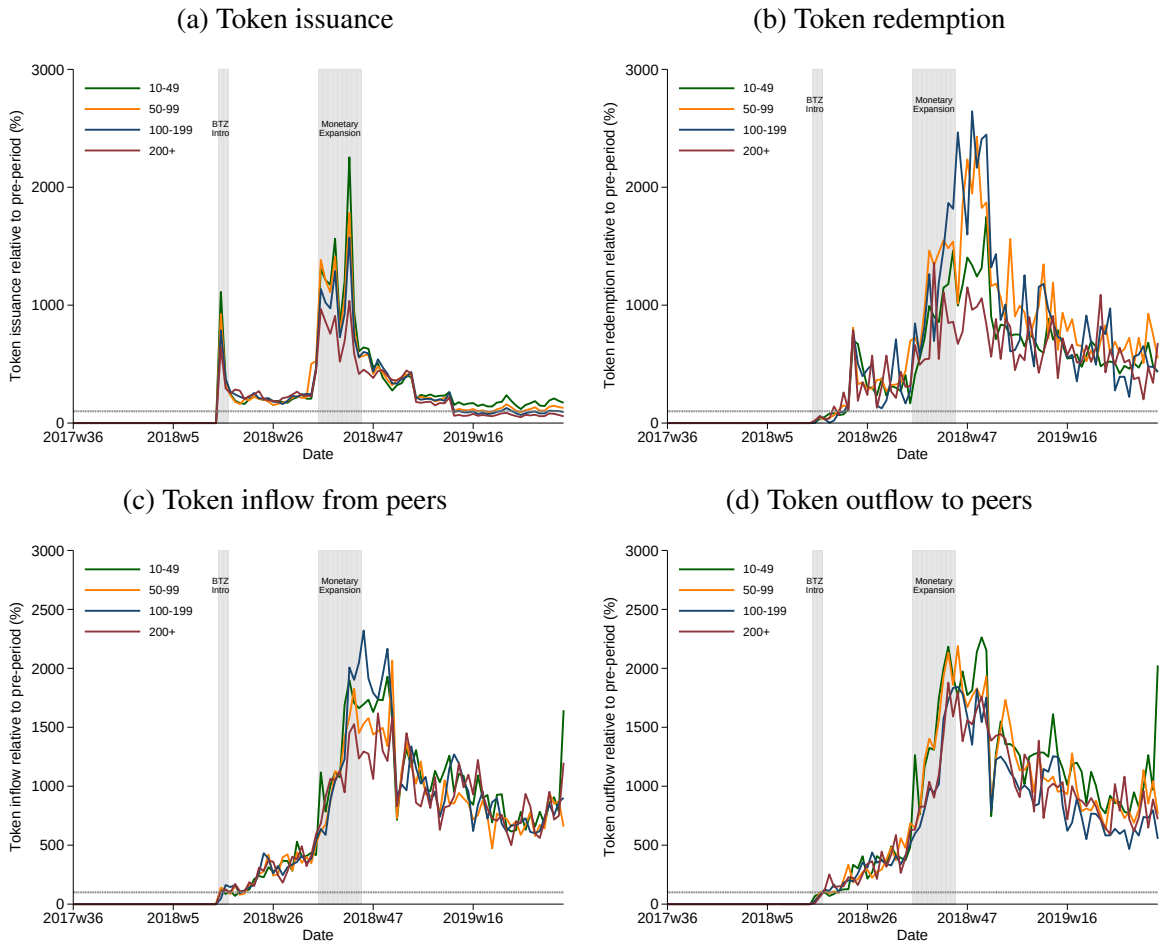
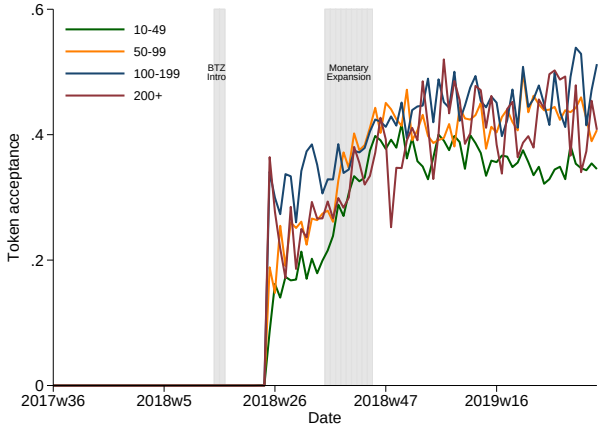


Figure A5: Token issuance and redemption, before and after monetary expansion, by user transaction intensity



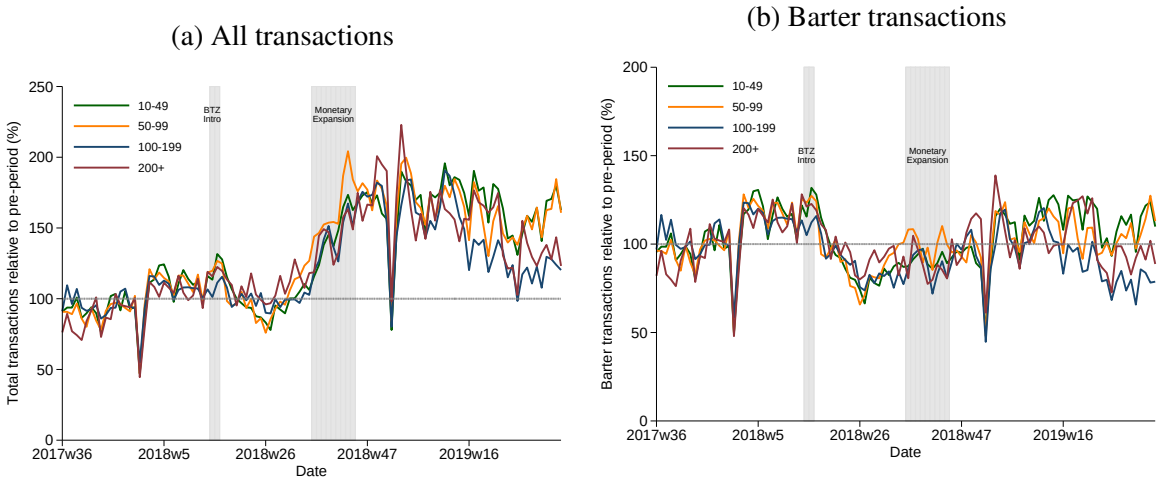
Notes: This set of figures shows the effect of monetary expansion on (a) token issuance, (b) redemption, (c) outflow to peers, and (d) inflow from peers of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as week 36, 2017 to week 35, 2018. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

Figure A6: Token acceptance, before and after monetary expansion, by user transaction intensity



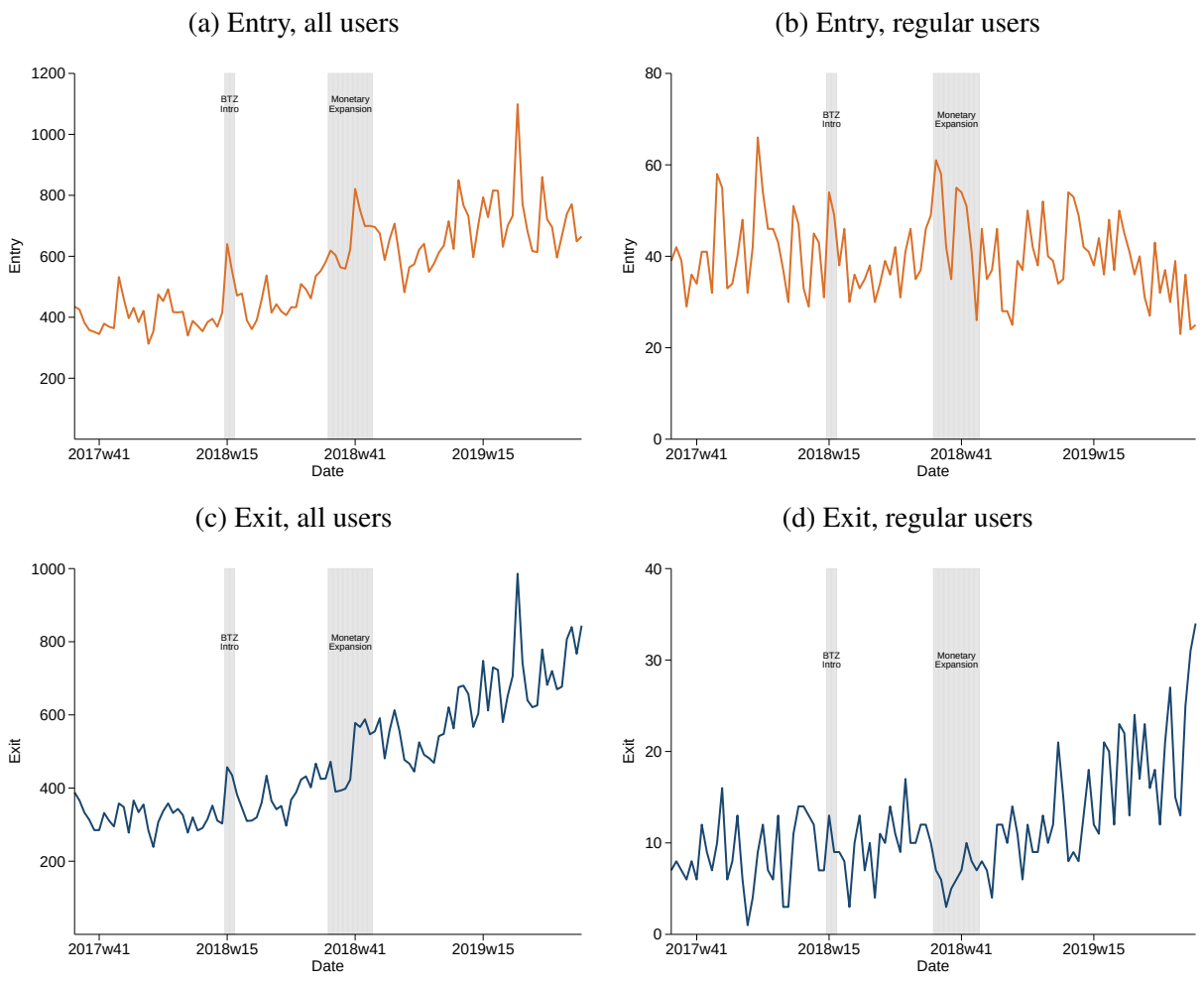
Notes: This figure shows the effect of monetary expansion on token acceptance as measured by the share of items posted with a BTZ price of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as week 36, 2017 to week 35, 2018. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

Figure A7: Barter and token-mediated transactions, before and after monetary expansion, by user transaction intensity



Notes: This figure shows the effect of monetary expansion on (a) all transactions and (b) barter transactions of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as week 36, 2017 to week 35, 2018. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

Figure A8: Entry and exit, before and after monetary expansion



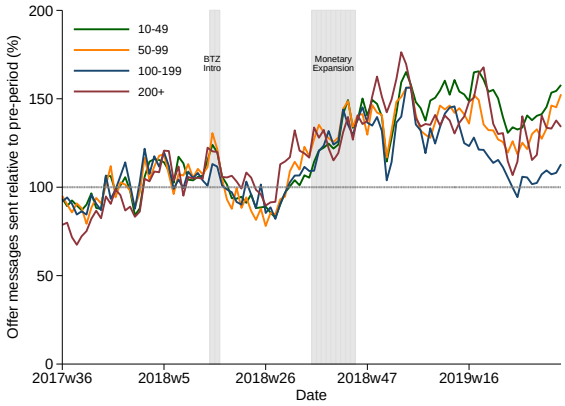
Notes:This set of figures shows the weekly trend in the number of new entries counted by the first message sent by users and exits counted by the last message sent by users of all users and regular users. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. Gray bars indicate the first and second wave of monetary expansion.

Figure A9: Margins of response, before and after monetary expansion

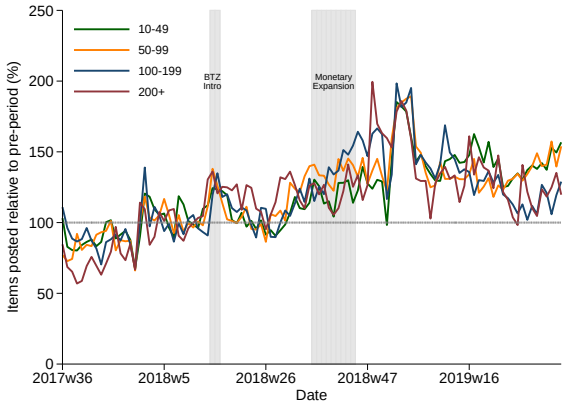
Notes: Figure shows the weekly trend in (a) offers messages sent (b) transactions per offer (c) items posted on the platform (d) share of token expenditure used for redemption. Gray bars indicate the first and second wave of monetary expansion.

Figure A10: Offers and items posted, before and after monetary expansion, by user transaction intensity

(a) Offer messages sent

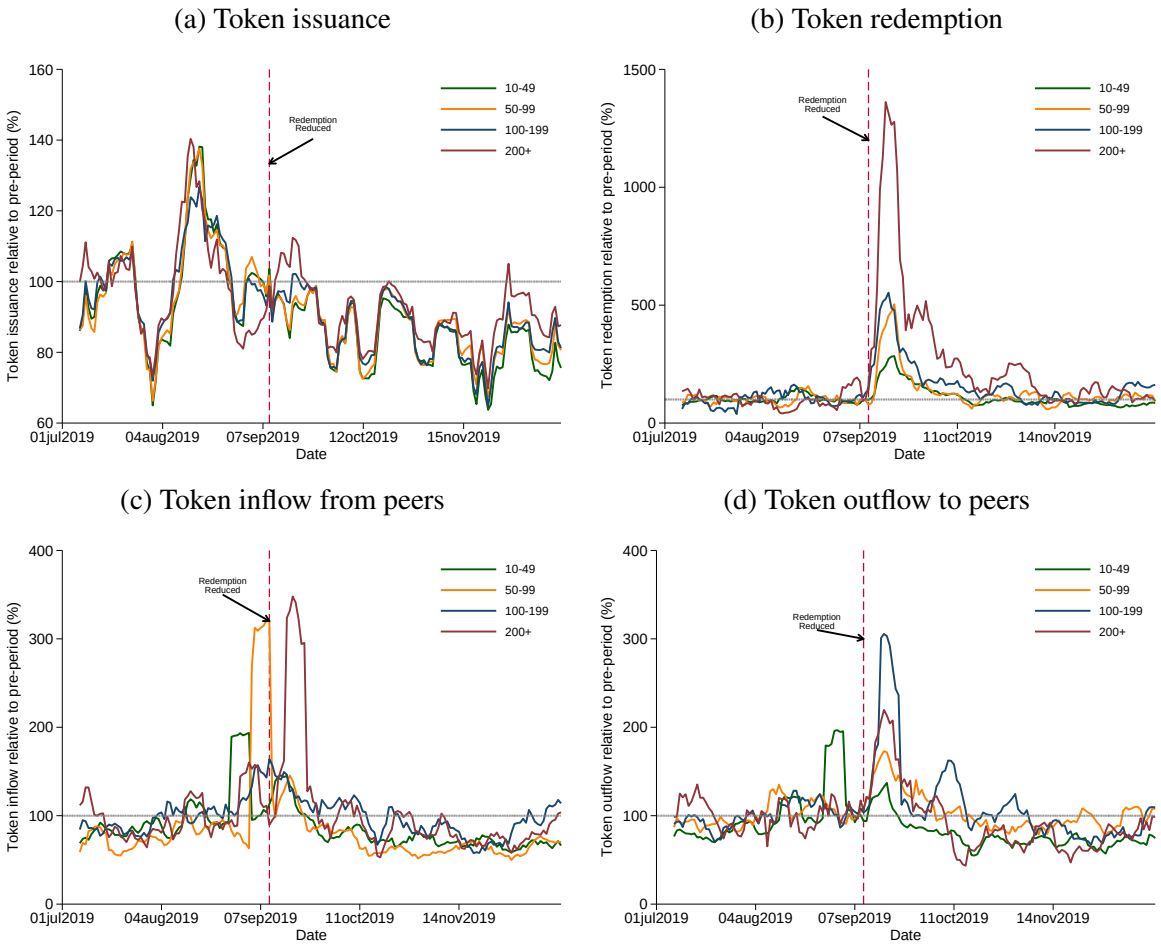


(b) Items posted



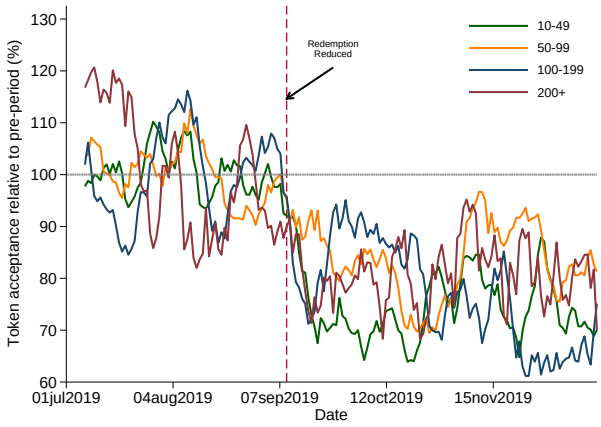
Notes: This set of figures shows the effect of monetary expansion on (a) offer messages sent (b) items posted on the platform, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as week 36, 2017 to week 35, 2018. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months.

Figure A11: Token issuance and redemption, before and after reduced redeemability, by user transaction intensity



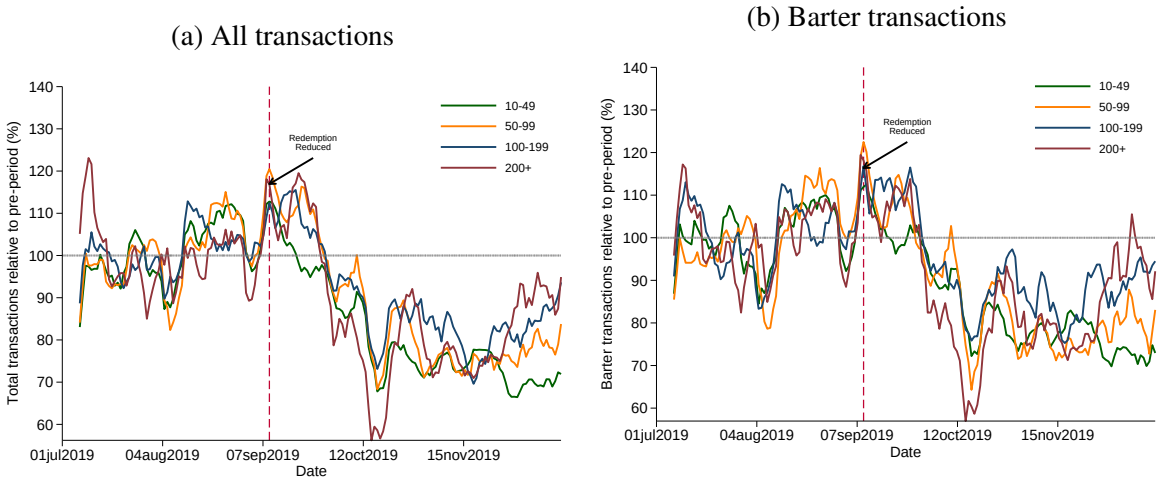
Notes: This set of figures shows the effect of reduced redeemability on (a) token issuance, (b) redemption, (c) outflow to peers, and (d) inflow from peers of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as July 1 to September 9, 2019. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

Figure A12: Token acceptance, before and after reduced redeemability, by user transaction intensity



Notes: This figure shows the effect of reduced redeemability on token acceptance as measured by the share of items posted with a BTZ price of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as July 1 to September 9, 2019. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

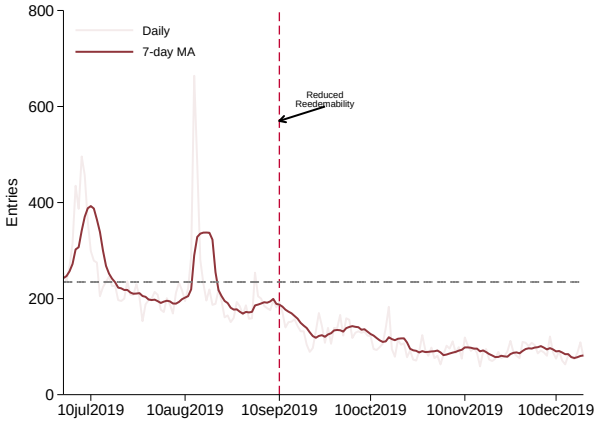
Figure A13: Barter and token-mediated transactions, before and after reduced redeemability, by user transaction intensity



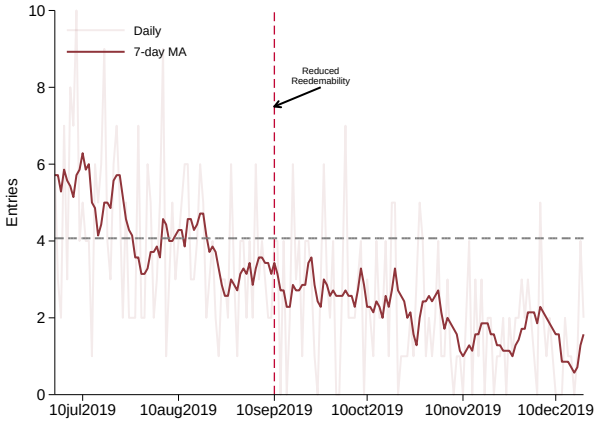
Notes: This set of figures shows the effect of reduced redeemability on (a) all transactions and (b) barter transactions, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as July 1 to September 9, 2019. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

Figure A14: Entry and exit, before and after reduced redeemability

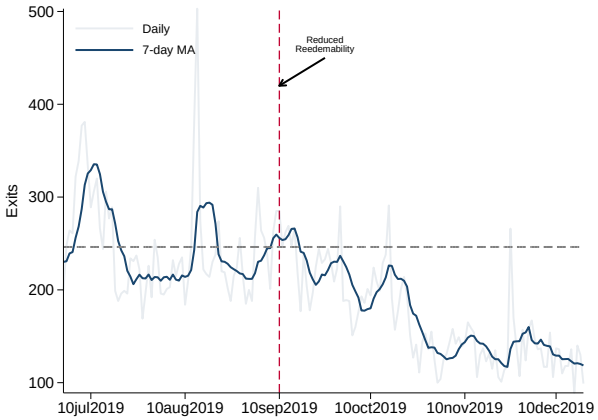
(a) Entry, any user



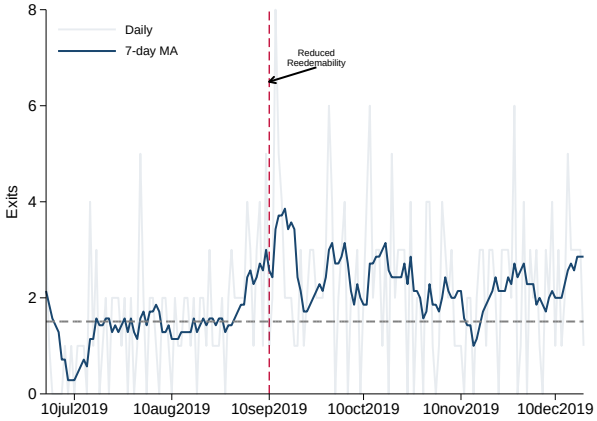
(b) Entry, regular users



(c) Exit, any user

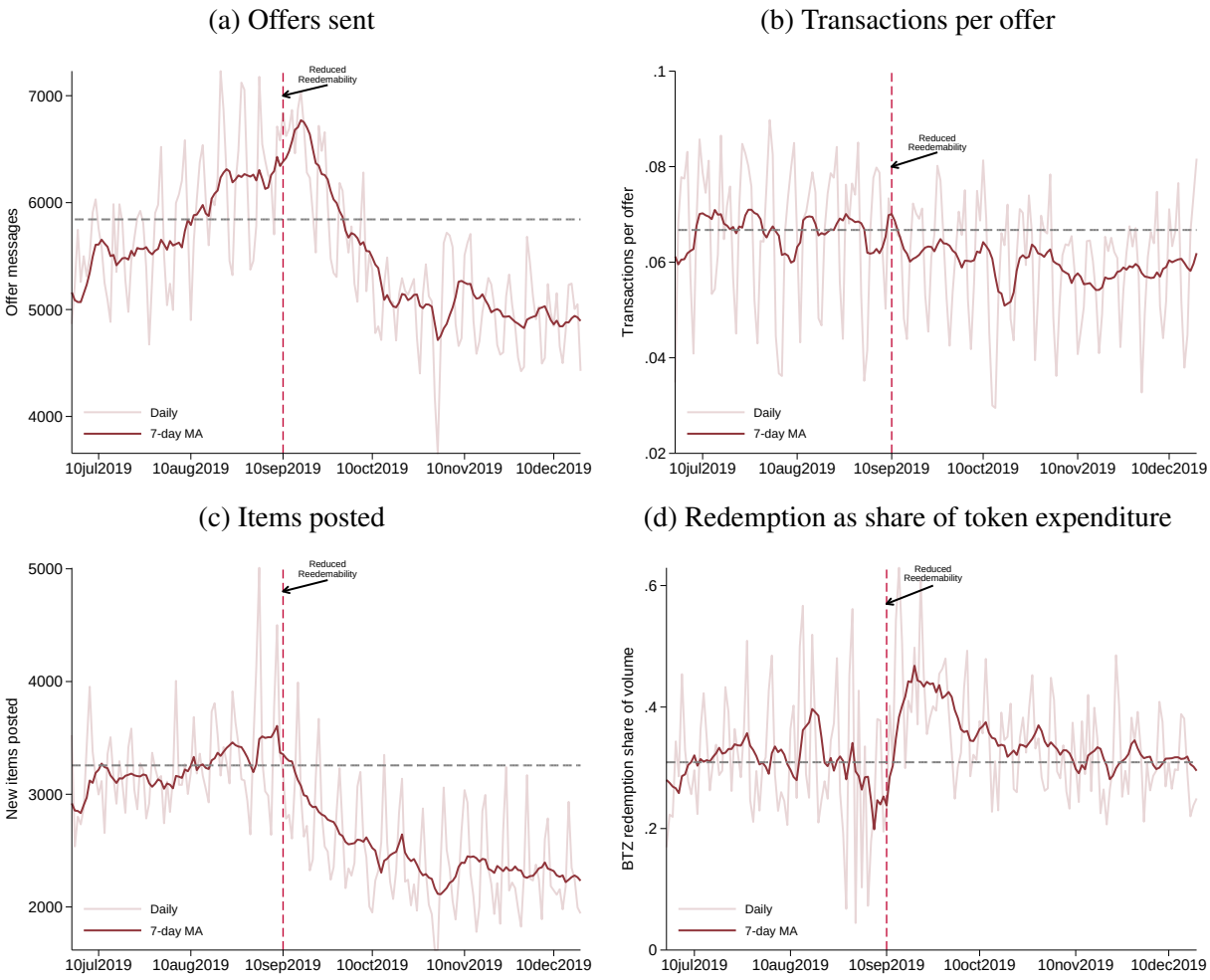


(d) Exit, regular users



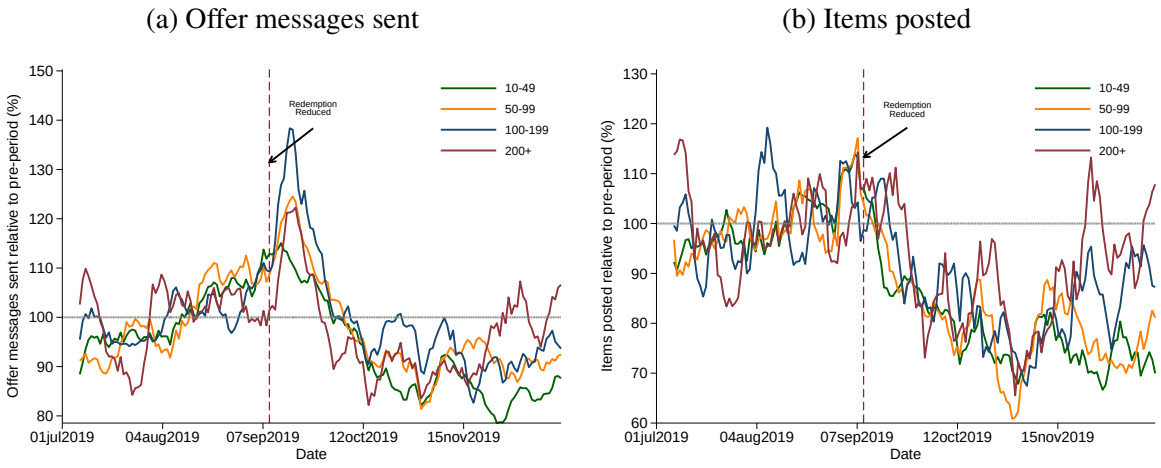
Notes:This set of figures shows the weekly trend in the number of new entries counted by the first message sent by users and exits counted by the last message sent by users of all users and regular users. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. The red dashed line indicates September 10, the day of partial cessation of Shop Local program.

Figure A15: Margins of response, before and after reduced redeemability



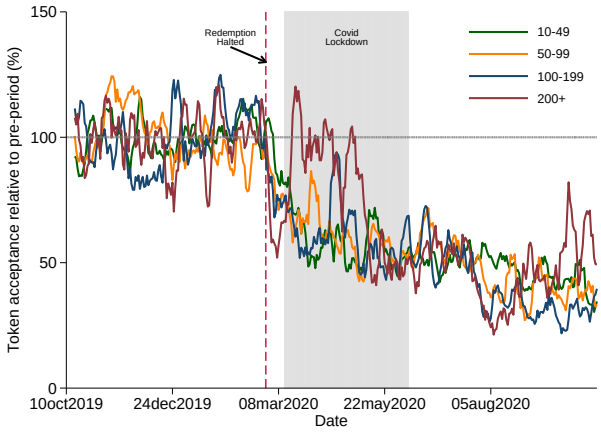
Notes: Figure shows the trend in (a) offer messages (b) transactions per offer message (c) new items posted in the app (d) share of token expenditure used for redemption. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates February 28, the day of final cessation of Shop Local program.

Figure A16: Offers and items posted, before and after reduced redeemability, by user transaction intensity



Notes: This set of figures shows the effect of reduced redeemability on (a) offer messages sent (b) items posted, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as July 1 to September 9, 2019. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

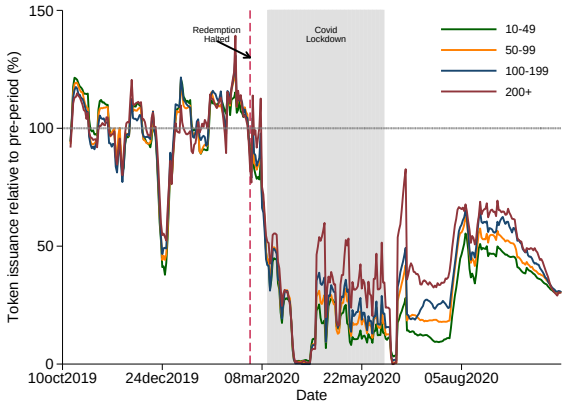
Figure A17: Token acceptance, before and after redemption halt, by user transaction intensity



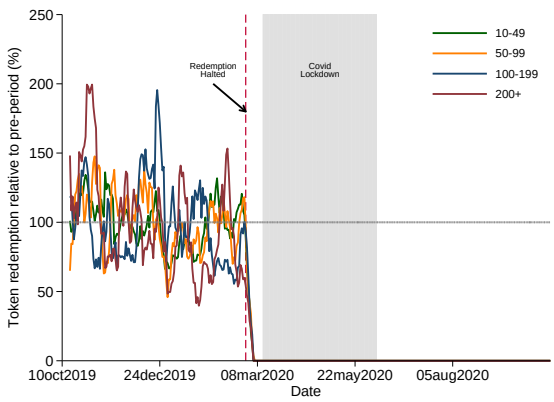
Notes: This figure shows the effect of redemption halt on token acceptance as measured by the share of items posted with a BTZ price of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as October 10, 2019 to February 27, 2020. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

Figure A18: Token issuance and redemption, before and after redemption halt, by user transaction intensity

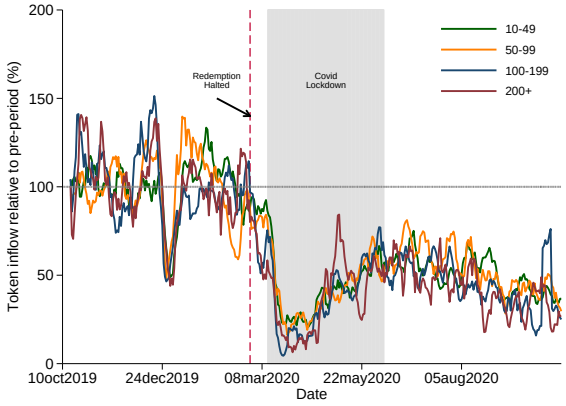
(a) Token issuance, regular users



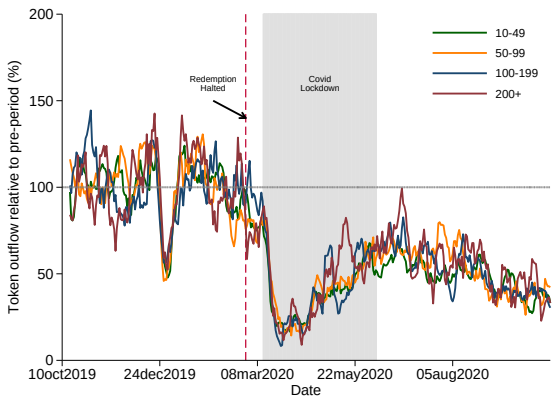
(b) Token redemption, balanced sample



(c) Token inflow, regular users

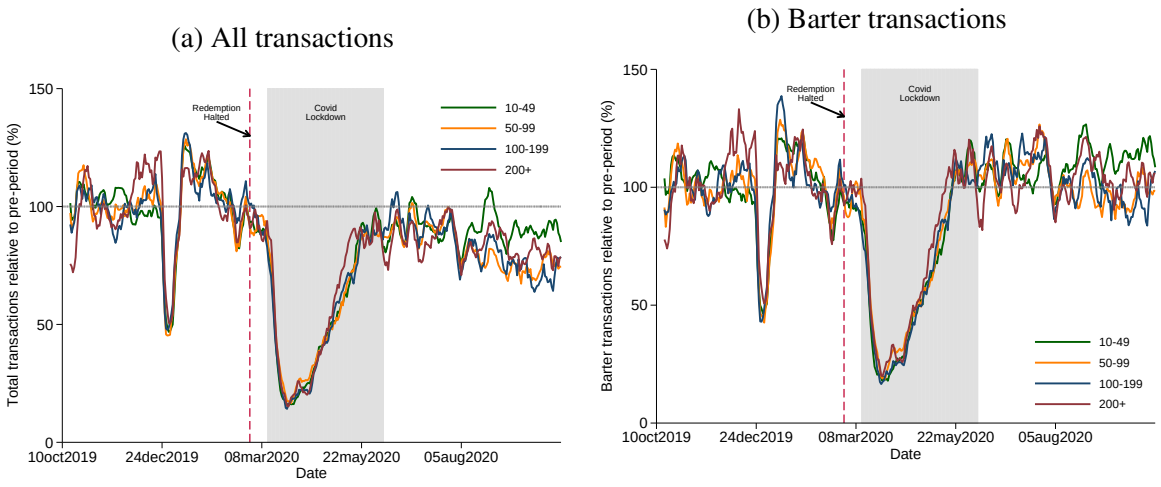


(d) Token outflow, balanced sample



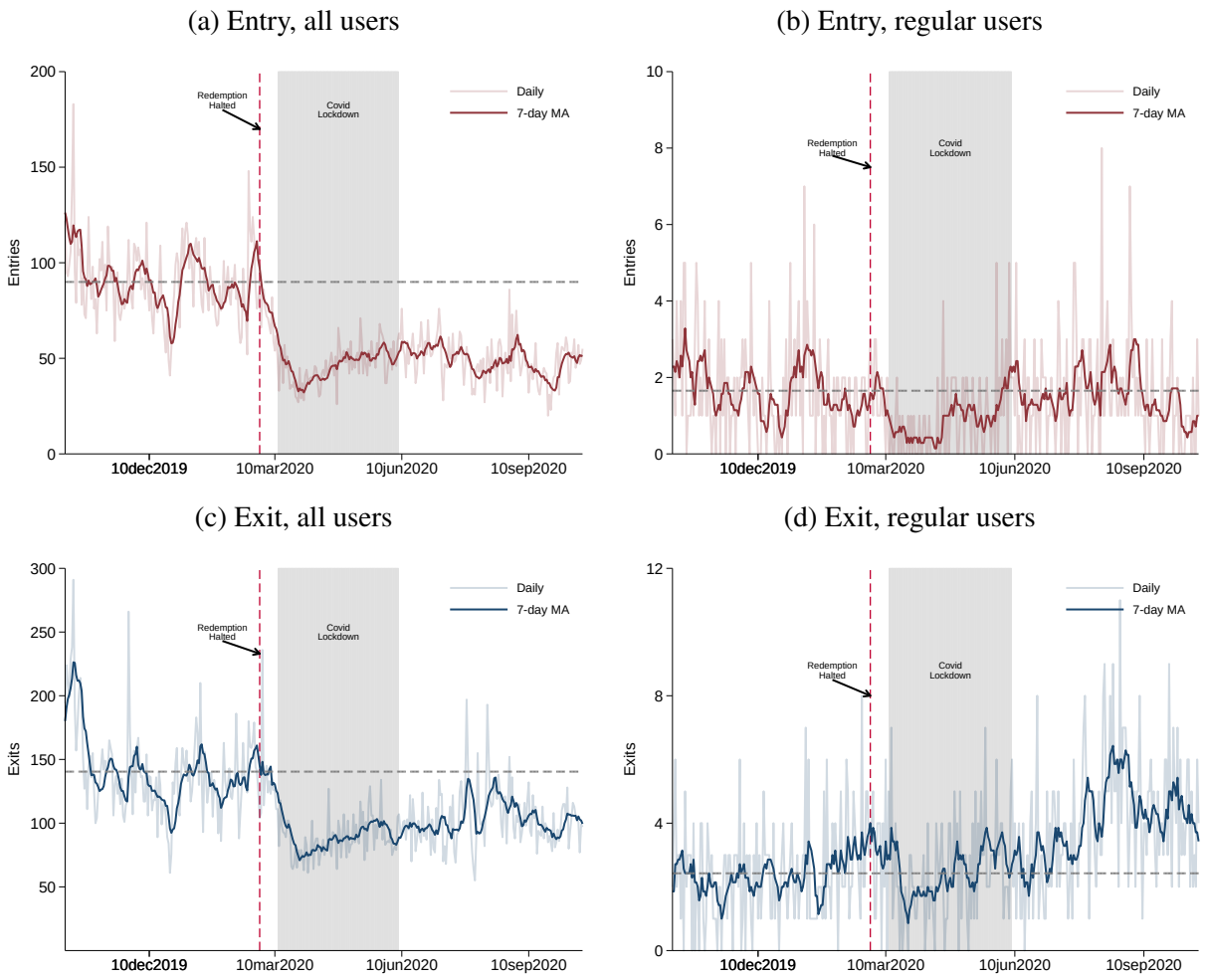
Notes: This set of figures shows the effect of redemption halt on (a) token issuance, (b) redemption, (c) outflow to peers, and (d) inflow from peers of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as October 10, 2019 to February 27, 2020. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

Figure A19: Barter and token-mediated transactions, before and after monetary expansion, by user transaction intensity



Notes: This figure shows the effect of redemption halt on (a) all transactions and (b) barter transactions of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as October 10, 2019 to February 27, 2020. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

Figure A20: Entry and exit, before and after redemption halt

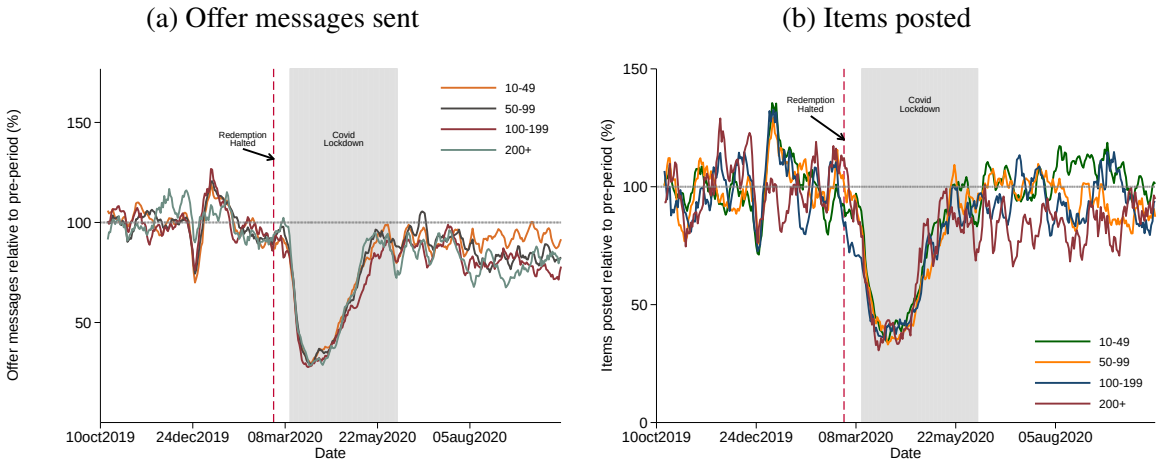


Notes: This set of Figures shows the trend in the number of new entries counted by the first message sent by users and exits counted by the last message sent by users of all users and regular users. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates February 28, the day of final cessation of Shop Local program.

Figure A21: Margins of response, before and after redemption halt

Notes: This set of figures shows the weekly trend in (a) offer messages (b) transactions per offer message (c) new items posted in the app (d) share of token expenditure used for redemption. The dark lines show the 7-day moving average, while the light lines show the daily trend. The red dashed line indicates February 28, the day of final cessation of Shop Local program.

Figure A22: Offers and items posted, before and after redemption halt, by user transaction intensity



Notes: This figure shows the effect of redemption halt on (a) offer messages sent (b) items posted of regular users, separately for users grouped by their transaction intensity as measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event. The pre-event period is defined as October 10, 2019 to February 27, 2020. Regular users are defined as those who have at least 10 transactions during the entire sample period, with a maximum of 70% of transactions concentrated in one month, and have been active users for at least 6 months. All lines show the 7-day moving average.

B Additional Documents from the Field

B.1 Bunz FAQ (April 6, 2016)

BUNZ TRADING ZONE : FAQ

Updated 4/29/16

WHAT IS THE BUNZ TRADING ZONE:
It's a cashless trading zone, inhabited by a community of barterers.
"I'll trade you my bag of sour keys for your bar of soap."

What is Bunz for?
To get what you want for what you have and connect with your community.

Do you have rules?
We only have one BIG RULE: NO CASH IN THE ZONE.
What we do have are guidelines/etiquette, some of which are learned through trades, many are in the Community Guidelines (which you should read!) and some are below in the answers.

How do I Bunz?
Posts take two forms:
1) Either you have something to get rid of, which you describe and/or post a photo of, or make a service offer, and then you post what you'd like (ideally) in return.
2) You post something you're looking for (ISO = "In Search Of", or "I'm Seeking Out") and either suggest what you may have to offer in exchange or say "Name your trade".
3) **The BEST AND MOST EFFICIENT WAY TO BUNZ IS THROUGH THE APP.** We built it for that purpose alone! It's available on iOS, Android and on the web at www.bunz.com use invite code 777 777

An **ISO** can literally be anything, but something important to keep in mind about **VALUE**:
-Something that someone is getting rid of might still be valuable to them, either in cash or emotional value. It's not wrong to want equal dollar value for something, but then be explicit about that in your post. Please also consider that material goods depreciate in value, quickly.

People are looking for deals, so give them! You'll get them in return, pinky swear. PAY IT FORWARD, BUNZ!! On the flip side, you might try to lowball a trade, like offering 2 tokens for an iPhone. Not likely to go through, but you can always try.
So, the solution for both is: be realistic. Nobody is going to give you a PS4 for your stained + broken chair, so get creative and offer combos! You need a vacuum? Offer tokens AND beer AND cheese!

Either way, we really like a concept floated by our community called **#TRUETRADES:**

The #truetrades principle is simple: it's when the person looking to get rid of something is willing to take something you already have around (as opposed to buying things just to trade with) - on principal of paying things forward and being a good bun. You'll sometimes see posts tagged this way, and that's what it means.

Where can I trade?
As long as you and the other person agree on a place, you can trade anywhere in the city. Many Bunz will include the neighbourhoods they live / work in somewhere in their posts so that others get a sense of how far they will be traveling for the exchange. If you do set up a trade with someone on the other side of town, we recommend picking a midway point that works for both of you. TTC Stations are a great, safe place to meet.
Many people are more than happy to do trades from their homes, but for those who may not be comfortable giving out their address, we have been partnering up with local coffee shops and bars around Toronto to create actual Bunz Trading Zones! These places are all run by Bunz and will have your back! There's 7 now but there will be dozens by the fall, stay tuned as our listings grow, and check out the Bunz blog for featured zones:

What are common trade 'currencies', if we can't use cash?
The most common currencies in the zone is booze, TTC tokens, houseplants and consumables.

What's a consumable?
Things you consume - food mostly, but may include things like toiletries.

I lost my bike or pet! Can I post it here?
Sure. But if you get it back, please update the thread and celebrate your reunion with the group.

Someone broke my heart! Can I post ISO good vibes and pictures of cats?
No, please don't. It clogs up the feed and there's Bunz Helping Zone for things like that.

A bun flaked on me like a day-old croissant! I want to yell about it!
Well, the trading zone isn't the best place for that. It happens. People forget, things come up, people miscommunicate, etc.

It helps to BE FIRM with times and places and make sure you're on the same page. It happens to everyone, and it's rarely malicious flakey-ness. In the app, we have the 'review' feature which helps keeps people accountable to each other.

Hey, where'd my post go?
Probably deleted because it didn't have a place in the zone. Please read the Community Standards document to see where you may have gone wrong. Maybe explore the BUNZ MULTIVERSE and you can find a better home for your post.

Is there a list of groups in the BUNZ MULTIVERSE?
YEP: HERE! There are also many 'secret' groups which you can learn about by just engaging with the community - there's a zone for everything!

Can I make a new Bunz group for whatever I want?
Short answer: We kindly ask you **not to.** There's over 100 Bunz groups, and chances are that one exists for what you want - ask about it in BTZ, or in Helping Zone. If you think a niche or geographic area is being underserved, please message an admin!

How can I make my BunzLyfe EVEN BETTER?
Get social with us!! Come to events, meet-ups and trade parties. Follow us on Twitter @bunztradingzone / Instagram @bunztradingzone / Snapchat @bunztradingzone

Bottom line: trade culture is fun, exciting and addictive. Be the best Bunz you can be! Trade right, and your life will improve, 100% guaranteed.

B.2 Screenshots of the Bunz Mobile App

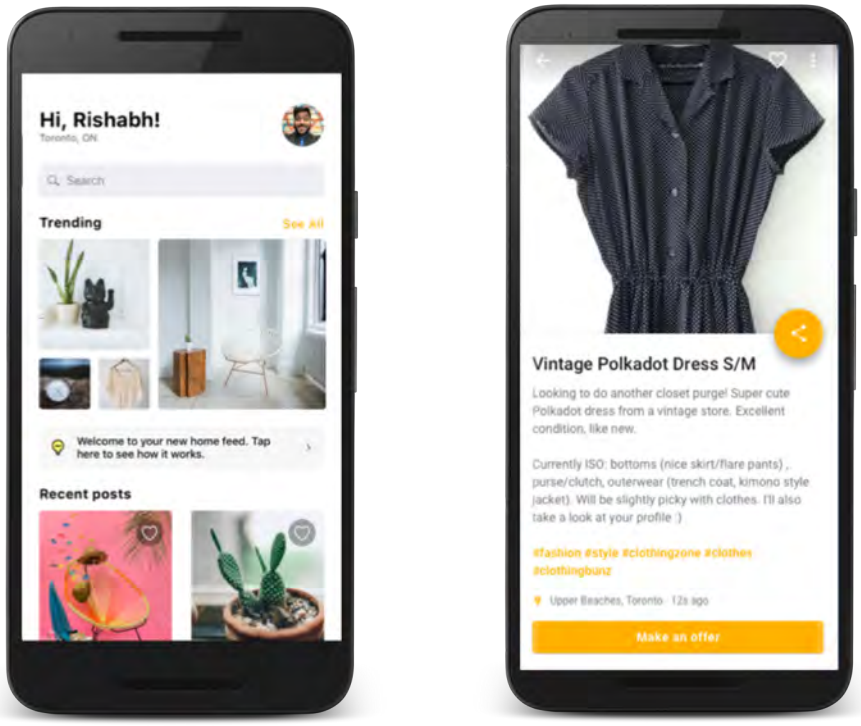


Figure is from an official blog post by Bunz, published on September 1, 2017, before BTZ introduction, available at https://blog.bunz.com/back-to-bunz-basics-dbcef3810c8e.

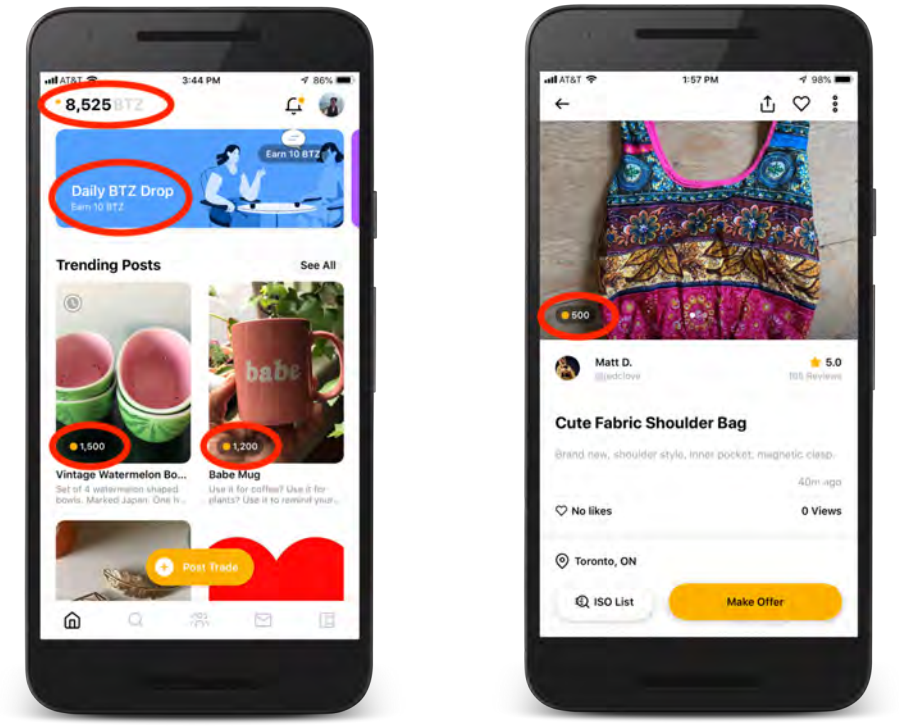
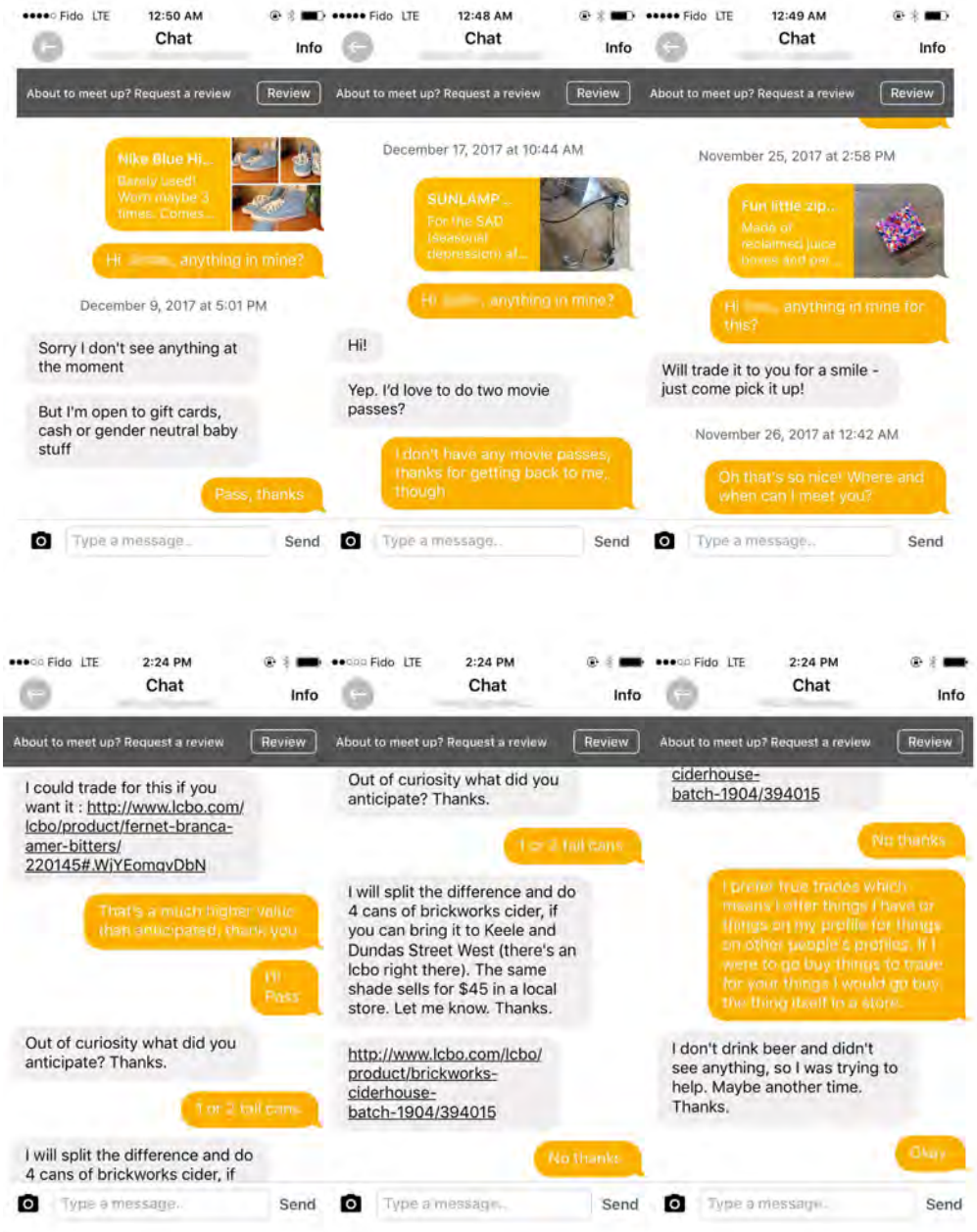


Figure is taken by the author on June 18, 2019, after BTZ introduction, with red circles added. These images are taken from a blog post from Bunz. More information about the app's early days is available at: https://rishabh.ca/work/bunz



Examples of in-app interactions are from a weekly local free newspaper providing tips for Bunz traders, published on December 28, 2017 (Kaur 2017).

B.3 Letter to Shop Local Partners (September 9, 2019)

Dear Makers and Shop Local Businesses –

I send this email with a heavy heart, as we could not have become the platform we are without the love and support from each and every single one of you.

After a deep dive into our company priorities, Bunz will only be running the Shop Local Program revolving around food and coffee, as this is where our focus will be moving forward.

Effective immediately, you will no longer be able to accept BTZ and convert them into CAD currency.

We will be locking your wallets, and everyone will be paid up to September 10th inclusive, so please don't worry about any revenue that you brought in through the program as we will be settling your account with you and removing you from the application.

If you have any questions or concerns, please don't hesitate to reach out. I will be by within the week to come and collect the Bunz assets in your possession, so please do not throw them away!

Notes: Email from Bunz to Shop Local partners announcing immediate cessation of token redemption except for coffee shops and restaurants. Taken from item post by Alisa Yao on September 10, 2019.

B.4 Bunz blog post after reducing redemption (September 10, 2019)

Bunz,

As you may have noticed, yesterday we had to make the very difficult decision to reduce the merchants and makers who accept BTZ to just coffee and food. We are sorry for any inconvenience and disappointment this may have caused and want to keep you informed as to why we had to make this decision.

Trying new ideas is really hard. There are very few examples of companies that have attempted to share their revenue with its community like Bunz. We are still learning and adjusting the platform as we learn more about how it's used. This requires us to make hard choices at times and this, unfortunately, was one of them. This change to the program is not an ideal outcome and we are sorry for any difficulty this may cause to individuals, merchants, and the community. As a start up trying to do things differently, this was a necessary change we had to make on short notice for sustainability reasons.

In addition to this, we made another difficult decision today that allows us to sustain Bunz and BTZ going forward. This was having to say goodbye to 15 members of our team. This decision was equally difficult because a number of us have been working on Bunz since day one. I'm sad to see them go, but also know they have great things ahead of them.

The reality we face is that it's expensive to build and maintain a platform that hundreds of thousands of people use every day. It gets more expensive when you try to ensure those people see material benefits from using it. Reducing the merchant list was necessary to continue Bunz and BTZ for the community. We believe that these changes put us in the best position possible to allow you continue to use BTZ day-to-day.

Having said all this, we've still achieved something amazing over the last 14 months — since first launching BTZ. Our community of users and local businesses have earned and spent over $1.4 million because of this program. This is something we can all be proud of.

As a result of these decisions, we are able to continue to make Bunz and BTZ a community-focused platform in a more sustainable way. We admire our community for caring so much — you are the reason why Bunz exists and the reason we get up every day to try and change who benefits from platforms.

To the merchants and makers we've had to part ways with, we appreciate everything we achieved together through the Shop Local program and we wish you nothing but success.

Thank you for your understanding.

Sascha + Bunz HQ

B.5 Palz statement after reducing redemption (September 11, 2019)

Hey everyone,

Former Bunz Admins here. We wanted to reach out to our community(ies) and talk a little bit about what happened today.

Here's a background:

- Yesterday, September 11th, Bunz HQ announced that its BTZ (in-app currency) would no longer be accepted by vendors or makers that are not coffee shops, restaurants, or bars.
    - This means that small businesses that relied on BTZ to bring in new business, or even vendors who started facilitating their goods and services through the Bunz app and by accepting BTZ as a form of currency, are now out of luck.
    - These vendors and makers were not informed about these changes within the appropriate time frame which, as per their contracts, was to be informed of any changes within two weeks.
    - As a result, makers specifically have now been shut out of the previous Bunz app/BTZ system of trade and had no time to inform consumers of this change. They haven't only lost potential customers and clients, but have also lost income streams that are crucial to the survival of small businesses in Toronto.
- On top of changes to BTZ, Bunz announced that they have fired 15 of their staff. We estimate that this is approximately three-quarters of people whose livelihood depended on the Bunz brand.

Here's what we have to say about it:

- Makers, innovators, artists, creatives, activists, advocates, and regular, everyday people are the backbone of what was once the Bunz community. We all came together several years ago as people who believed in the value of the little things. The value of a half-eaten pizza, an old cassette tape, a joint, a tall boy, a jar of spaghetti. Most of us didn't have much money, and none of us had the means to create apps, or profit off of our relationships with one another.
- Monetizing our communities completely contradicts the barter system that birthed the Bunz lifestyle, as well as the anti-capitalist practices that have shaped our collective communities.
- Today, we would like to reclaim our communities. We would like to bring Bunz back to what it once was. We want our groups to remember why they exist. We do not want to profit. We do not want your app sign-ups. We do not want you to buy into an online currency that will let you down.
- By returning Bunz to its original form, as a pushback against the absolute exhaustion—financial, emotional, and physical—that goes hand in hand with living in cities that are dynamic, fast-paced, expensive, and ever-changing.
- We fundamentally love our communities. As admins of Bunz, and the people who have spearheaded the growth of our communities, and of the app alongside you all, we have a vested interest in your wellbeing. Only your wellbeing. No app sign-ups, no growth, no "buy-

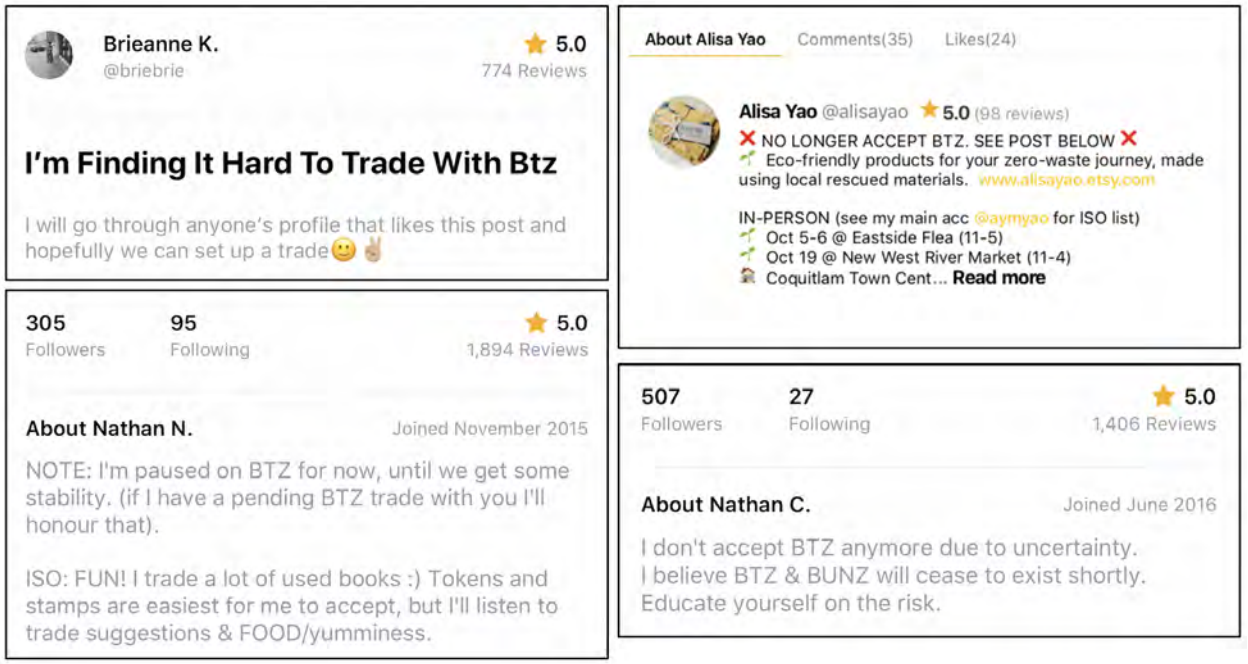
in," only genuine human connections and a commitment to kindness, compassion, and community-building.

With all that said and done, we want to introduce *Palz*, a collective comprised of former Bunz admins who believe in something bigger than profit.

Our groups will stay the same, our values will stay the same with a commitment to hearing from you, a commitment to existing outside of the scope of trademarks, corporations, advertisements, and the monetization of human connections. We hope that this new chapter can sustain our community's health, growth, and compassion.

With Love,
Your Palz

B.6 Response to Scaling Back of Shop Local program among Users



Notes: Item posts and user profiles after partial cessation of Shop Local program on September 10, captured by author on September 23, 2019.

B.7 Bunz announcement (February 28, 2020)

BTZ Shop Local Redemption - Gaming Update

Please note that as of today, we will be temporarily pausing the Shop Local Program. An internal audit and review has been conducted of the BTZ rewards program and the Shop Local program, and despite many people using the program properly, several critical issues were flagged around the gaming of BTZ rewards. Our engineering team will be implementing additional checks and controls, which we will communicate out once those controls are in place. Any shops that participate in our Shop Local program will be paid up in full for any amounts owed up to the pause, and we will communicate with both the Shops and with the community once the protective changes are in place and the pause is lifted. We apologize for the short notice, and we appreciate your patience while we work. -Bunz

Notes: Public Announcement by Bunz HQ in the Bunz website and app on February 28, 2020.

B.8 Interviews with a frequent user

First interview: May 28, 2019

On May 28, 2019, the Bunz staff introduced me to a self-described "power user," who specialized in trading vintage books and had completed more than a thousand trades on the platform. Because of his deep engagement with the app, he had many insights about the mechanics of trade on the app. His observations therefore provide useful context for understanding the quantitative results in this paper. For this reason, I provide a partial transcript of the interview, which is reconstructed from handwritten notes and reorganized for clarity.

Author: How did you learn about Bunz?

User: I learned about it from Reddit. I've been on Bunz for four years now. I started when Bunz was still entirely on Facebook. I started trading because my friends had to give away their book collections, so I had two libraries to get rid of.

Author: How is the app different from the Facebook groups?

User: The Facebook groups are more chatty. The app provides a more durable posting. I can optimize for search visibility and time my posts. When app was new, about half of the trades in the community happened on Facebook, so sometimes I would post on both. Now 90% of trades happen on the app. I don't post on Facebook for transactions anymore. I post on Facebook only for discussion.

Author: What do you trade on Bunz? Do you face competition on the platform?

User: I focus on vintage books. Books that don't have ISBN codes, hence cannot be fulfilled by Amazon (FBA). I source books from garage sales, library sales, Craigslist, and other platforms. I don't really have any competition on the platform. I'm the only "predator" bookseller on Bunz platform. My real competition is mass market book sellers like Amazon. I cannot make that much money on Bunz because of competition from FBA.

Author: Why you do trade on Bunz?

User: Here are my options: Bunz, donate, or sell. I enjoy trading on Bunz, much more so than Craigslist. I can have conversations with the people I trade with. There is a feeling of community.

Author: How often do you trade?

User: I complete on average 2 trades per day. This is much more than most users, for sure. The value of trade is $3-25 per transaction. This is on the low end for users. Each day, I post 3 or 4 sets of books. There are many subcommunities on Bunz trading different things. The clothing subcommunity is totally different from books, for example.

Author: Do you have repeat customers?

User: Yea sometimes, up to 4-5 transactions. Sometimes I'd message them to market products.

Author: Do you prefer certain currencies?

User: BTZ and tokens are preferred. BTZ are useful, but it is like a hot potato. I also take cash or food. Sometimes, I'll take books to use as currency at a later date or sell them to used book store. I put hints into postings as to what is wanted (BTZ and token). I take BTZ for probably a third to a half of my transactions. The main thing is I want something that holds value. Gift cards are not personally useful for me, and I don't want to flip it for a loss. For BTZ, there is default risk. You don't want to accumulate it, so pass it around like a hot potato. The problem with BTZ is there's no exchange anywhere.

Author: Who pays in BTZ?

User: Two types: New users. They get a free book from opening a new Bunz wallet. Also heavy users who accumulate and then use BTZ.

Author: What do you do with your BTZ?

User: If I've accumulated BTZ, I mostly spend it down by eating at local merchants.

Author: How do trades happen?

User: About half of the time, the first message I get from an interested buyer is "I'll give you X tokens or X BTZ." The other half of the time, the first message I get is "I'm interested." I'll respond with "What can you offer?" I'll scan their profiles, but 90% of the time I'll steer towards BTZ or token. There are important breakpoints in conversation, where a buyer might drop out, such as when arranging a location. I don't typically negotiate much, since books are pretty low value.

Author: Do you choose whom to trade with / care about buyer reviews or reputation?

User: Reviews are not a super informative signal of buyer reliability. Many people will not review informatively. Number of reviews is more likely to be a reliable signal. For users with <20 reviews, I'll take a different approach. I'm less flexible and won't travel to trade. The main issue is flakiness and ghosting.

Author: Do you ever receive delayed payments or payments in advance?

User: Majority of time, trades are simultaneous. Occasionally, I may get advanced payment as deposit or because cellular data is wonky. Occasionally, I get deferred payment. Sometimes it's a new user who can't remember PIN, or bad cell data; sometimes it's repeat user who is low on cash but can deliver BTZ later (pre-arranged before meeting). I'm usually nice and forgiving to new users because I want to be a good representative for the platform. Bunz's "Have fun" ethos is important to me. Building a good platform requires building a good culture: If everyone on the platform is nice, eventually you will be nice as well. I'm not sure you can replicate this culture anywhere else. Cool people were participating on Bunz at its start. That matters a lot.

Author: Has the introduction of BTZ changed the platform over time?

User: The original demographic was impoverished art students. Trades that are unequal in value were part of the appeal of Bunz. The lack of double coincidence of wants was a real thing. People can get lucky with a deep discount occasionally. This feels like magic. The introduction of BTZ cut

down on this "magic." It's not as fun anymore. Over time, people on the platform care much more about monetary value of items. They moved more towards a Craigslist view of the world. After introduction of BTZ, frictions are lower, so margins are lower, but I make this up with volume.

Second interview: October 18, 2019

About five weeks after the currency crisis, I spoke with User to hear his perspective. Below is a transcript of the interview, which is reconstructed from handwritten notes and reorganized for clarity.

Author: Tell me what happened.

User: It was about a month ago now. It was like a very little miniature demonstration of what a crisis of confidence in a currency looks like. It was like Venezuela trying to impose capital controls on spending. You could almost predict what would happen.

From the users' perspective, there was a reduction of the scope of the Shop Local program. The change was that you can now only redeem at restaurants instead of the full set of merchants. This was seen as a serious reduction in the utility of BTZ. Coupled with the layoffs, this change put into people's minds the question of the viability of the whole operation. This is something, apparently, many people had not considered. A large majority of users had never thought about the underlying financials and economics of what's going on.

A lot of the outrage is understandable but also manufactured. A lot of people had balances of BTZ, and were saving up for some service. For example, tattoos. Some lady saved up a hundred dollars for wedding gifts but could no longer buy those items. The CEO had commented that they would commit to a 30 days notice, but they did not do so. People discovered at the shops. The merchants just got this notice that their relationship was terminated. Not ideal management. But they needed to close the gate before everyone went running for the exit.

What's interesting is they have continued to operate restaurants. There still was a rush to the exit. I've been eating like a king. At some point, these BTZ may become valueless. So people are driven to spend.

Things have kind of stabilized now. BTZ are still being accepted at the reduced number of merchant. There were interesting effects on liquidity of BTZ. Lots of people stopped accepting BTZ. But at the same time there's a weird little force in the other direction. If you were to accept BTZ, then transactions are temporarily really fluid.

Author: How were you personally affected?

User: I've managed my BTZ very well, so it wasn't so bad. I held only about a hundred dollars of BTZ at the time. Others may be in a different economic strata too. For a period of time, I stopped taking BTZ. Took a trip away for two weeks. I've turned on the tap again now. Started about a week ago. Balance is low enough that I don't care about the risk. It is a fortuitous coincidence: I

always spent my BTZ mostly by eating. So I'm still able to cash out in the same way. And actually, trading is easier now, since people really want to get rid of their BTZ.

Author: Has the nominal BTZ price of books gone up?

User: Yes! Absolutely. There is a premium. People are just making up whatever premium for the risk. I'll add on 10-15%. What's the actual risk premium is quite unclear. No one knows what the risk is.

Author: At what price of BTZ did trade after the announcement?

User: Immediately someone decided to profit off of this situation. They tried to sell TTC tokens at a rate of 10 to 1. The reaction to that post was very interesting. Lots of people reacted negatively to it, saying he was profiteering from the situation. But this is hypocritical because they themselves are no longer taking BTZ. They would say: Capitalism is terrible. And they piled on this guy. Somehow he crossed a social norm.

There is premium for taking BTZ, but market consensus regarding the exchange rate has not occurred. There's no public record of trades. You cannot look up a price. So the valuation of BTZ is opaque. You can see the posted prices, so you don't know what the final trades are.

Author: Did your personal transaction volume change?

User: Things were somewhat unchanged for me, since I sell books. For larger value items, liquidity is more impaired. For trading with someone who might have been willing to take BTZ before, you would now have to use a different currency. Some people are still taking BTZ, but the premia are all over the place. Some even at face value. But immediately, 50% of sellers stopped taking BTZ.

Author: Have people left the platform?

User: Yes. The noisiest departures were for ideological reasons. This is related to the historical genesis of the Bunz community, which has a communist/hippie mindset, utopian ideals. So the Facebook groups decided to disassociate with Bunz. Renamed themselves to PALZ. Whether this will affect the trading on the app, I don't know.

Author: Were most people on the app aware of what happened to the Shop Local program?

User: It was widely known because there are people who stopped taking BTZ. You see this on people's profiles and in the messages. It's unfortunate, because the currency was operating smoothly. Adoption was pretty decent. Currency was circulating before it "leaked" out through people like me. The problem in fact is more that people could not get BTZ readily. Even if someone wanted a thousand dollars of BTZ, they could not get it. There was a liquidity crunch in the other direction.

Author: Have sentiments shifted in the month after the initial shock?

User: Things have settled down. More people accepting BTZ and risk premia is now lower. All the outraged people have just left. The only people left are the pragmatic people and newbies who don't know better. They think platform still works, so I'll post my armchair here. People have

short memories. But overall confidence in the currency is still low because no one knows whether they can continue to operate the shop local program. Nobody knows what their runway is. For sure, trade volume has decreased.

It could also be good for the platform to get rid of the ideologues. A lot of emotions flying around. They have a certain mental model for how the company should behave, but the company sort of had to do what they had to do. They chose not to shut down. Bunz is still perfectly usable in terms of functionality. Shop Local still operates. It's effectively like going back to launch time. They started out at just a handful of coffee shops. But the perception has now changed. Lots of cynical people knew this was going to happen.

Author: Do you know how the Shop local merchants were affected?

User: Merchants were redeemed up to some date. Everybody was made whole. They didn't receive their 30 days notice. If accepting BTZ had been part of your sales/marketing, e.g. 10% more sales due to accepting BTZ, then suddenly there's a revenue decrease. Negative is future cash flow is shut off. Negative reputation effects of that.

Some restaurants stopped accepting BTZ as well. Over the course of history, restaurants and stores have joined and left, but this was never a problem. There was a lot of confusion in terms of what was happening. IQ foods was still taking BTZ, but they temporarily froze on taking BTZ. But presumably this uncertainty was resolved and they began to take BTZ again.

Author: Is the pressure of money flowing out through redemption still the same?

User: It is definitely harder to spend a thousand dollars at once if the valve is coffee.

Author: Do you know what Bunz HQ's plans for the future are?

User: Listing BTZ on an exchange seemed like a long-term intention, like they would eventually allow the currency to float. But it ended up working more like corporate loyalty points. People are still using it because its convenient to do so. But this much more limited now. Rumors are the pause was driven by a failure to find financing. They could take the code and re-brand, try to launch elsewhere. There is no news, so nobody knows where the company is.