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

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Abstract

Using unique transaction-level data from digital currency experiments in a Toronto usedgoods barter economy, this paper tests core predictions of search-theoretic monetary models. Three unexpected monetary events are used to measure causal effects. Results show that (1) a large increase in token issuance persistently increased trade; (2) a partial halt in token redemption triggered a run and persistently reduced token acceptance and trade; and (3) a complete halt in token redemption further reduced token acceptance and trade, while leaving token prices unchanged. These findings are consistent with a model of redeemable money with price rigidity. The evidence highlights how redemption-run dynamics and community enforcement of redemption promises shape the viability of currency systems.

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1 Introduction

A cornerstone of monetary economics, dating to at least Adam Smith, is that money exists to overcome the inefficiencies of barter. Canonical models provide rigorous micro-foundations for the function of money as a medium of exchange (Lagos, Rocheteau and Wright 2017; Rocheteau and Nosal 2017), while laboratory experiments have increasingly tested the predictions of these models (Duffy and Puzzello 2014; Jiang et al. 2024; Camera 2024). Yet, a critical void persists: empirical evidence from real-world economies where barter and money coexist is remarkably rare. The little that exists relies heavily on anecdotes (Radford 1945; Sweeney and Sweeney 1977) or hand-collected cross-sectional surveys (Colacelli and Blackburn 2009).

The lack of field validation has led historians and anthropologists to challenge the empirical relevance of formal monetary theory and instead promote informal credit-based explanations for the origins of money (Humphrey 1985; Wray 2004; Graeber 2011). This paper directly addresses this research gap and critique. Leveraging unique transaction-level data from Bunz—a real-world barter community that introduced a redeemable digital currency—I test the theoretical predictions of a micro-founded model of money. In doing so, this paper provides rare real-world evidence to advance recent debates concerning the viability of unbacked and private digital currencies (e.g., Bitcoin and stablecoins).

The Bunz setting is in many ways ideal for the study of money and barter. Emerging after the 2008 Great Recession, Bunz facilitated the barter of second-hand items, such as clothing, accessories, plants, and groceries, among a cash-strapped population in Toronto. The community operated a mobile app platform that helped its roughly ten thousand daily active users meet and trade. It also created a digital currency, named BTZ, which could be either transferred among users or redeemed at designated local stores for retail goods at a fixed exchange rate. The dataset obtained from Bunz comprehensively captures both barter and monetary transactions in the entire Bunz subeconomy. Causal identification needed to test monetary theory is made possible by three unanticipated monetary experiments that are observed in the data.

To test theory predictions, my analysis focuses on the three monetary experiments. The experiments include: (1) a five-fold increase in token supply, (2) an abrupt restriction on redemption opportunities, and (3) an eventual termination of redemption. The effects of these monetary events on real trade outcomes are measured using interrupted time-series designs. The high-frequency data from Bunz are supplemented with interviews and observational analysis. An arsenal of robustness checks are performed to verify the validity of the conclusions.

In what follows, a search-theoretic model of redeemable money is sketched, with predictions that pertain to the effects of changes in money supply and redeemability in the Bunz economy. The theory is then backed up by empirical results, the most important of which are:

- Total trades *persistently* increased in response to a large increase in the level of token supply. The effect is in the range of a 57 percent increase. It is entirely accounted for by an increase in token-mediated trades. There were no corresponding changes in token acceptance, token prices, barter trades, or user entry.
- 2. Token acceptance *immediately* fell in response to a partial reduction in redeemability. Redemption volume increased in the short term, especially for frequent users, but there was only a limited impact on token supply. Token-mediated trade stabilized at roughly 32 percent lower about one month after the event.
- Token acceptance fell again in response to the final halt in redemption. However, it did not immediately fall to zero. There was an immediate but partial decline, after which token acceptance and token-mediated trade steadily declined towards zero.
- 4. Barter volume and user entry persistently fell after the first redemption reduction. The declines are best explained by reputational damage from the platform's breach of trust, which was widely reported in local news. In contrast, barter trade and user entry was much less affected by the final redemption halt, which was announced as a temporary measure to combat fraud and was not reported in local news.
- 5. Posted token prices did not detectably change throughout, even after redemption was halted.

These results are interesting for several reasons. First, they strongly support the basic premise in monetary theory that money enables trade. In each of the studied events, changes in money circulation were found to result in large changes in real trade. The effects are robust to controlling for individual fixed effects and time since entry. The effects are not only large, but also similar for users with different activity intensities. The assertion sometimes made by historians and anthropologists that formal monetary models are irrelevant in real-world settings is refuted.

Second, the evidence reveals the importance of redeemability for money circulation—a feature that is missing from many popular monetary models. In existing models, money acceptance is typically assumed to be universal. Long-run prices are typically modeled as flexible.¹ Moreover, models often focus on *fiat* and *commodity* money rather than *redeemable* money.² Yet reductions in token redeemability were found to have caused trade to persistently fall. To explain the evidence, the framework provided in this paper incorporates the historian's view that money emerged from redemption promises into a simple search-theoretic theory of money. The model shows that redeemability may be necessary for money circulation when price are rigid. This result not only rationalizes the evidence from Bunz, it also helps explain why currencies are often redeemable, including commodity-backed monies, pegged currencies, stablecoins, and bank deposits.

Third, the data provide rare empirical evidence that persistent price coordination frictions are possible. Such frictions have been extensively studied in theoretical models (e.g., Green and Zhou 1998, 2002; Kamiya and Shimizu 2006, 2007*a*,*b*, 2011; Jean, Rabinovich and Wright 2010), but corroborating evidence has been rare. In the Bunz data, it is found that posted prices did not adjust long after the redemption halt. This finding provides confirmatory evidence that prices can be persistently rigid in economies with decentralized price posting and coordination frictions. An implication is that market institutions—such as centralized exchanges that facilitate price discovery—matter for price flexibility and the efficiency of monetary systems.

Fourth, the data confirm that reputation concerns help to discipline currency redemption. Specifically, it is found that users retaliated against Bunz for its breach of trust. This finding suggests that

¹These theories include the quantity theory of money, the cash-in-advance model, the money-in-utility model, the New Monetarist workhorse Lagos-Wright (2005) model, as well as most models in the New Keynesian tradition.

²Here, I define *fiat money* as an intrinsically valueless medium of exchange, *commodity money* as a medium of exchange that can be used directly for consumption or production, and *redeemable money* as an intrinsically valueless medium of exchange that can be exchanged into a valued good from a trusted party. In the New Monetarist literature, most canonical models focus on fiat money, including Kiyotaki and Wright (1993); Trejos and Wright (1995); Shi (1995, 1997); Lagos and Wright (2005). Commodity money is studied in Kiyotaki and Wright (1989) and Burdett, Trejos and Wright (2001). Townsend and Wallace (1987) and Kiyotaki and Moore (2002) provide models of redeemable money in a Walrasian setting. Berentsen, Camera and Waller (2007) study circulating demand deposits issued by banks in a framework with search frictions.

currency redemption promises are subject to community enforcement, as previously emphasized by Kehoe and Levine (1993) and Gu et al. (2013*a*,*b*). Importantly, the data reveal that community enforcement did not simply operate in the background to prevent moral hazard; it significantly reduced trade by eliciting retaliatory punishment during a currency crsis. It is also interesting that a subsequent redemption halt that was quietly announced as a technical measure to combat fraud elicited milder retaliatory actions. This finding suggests that public relations management may moderate the impact of currency crises.

Finally, the data reveal a need for further theoretical developments. Specifically, it is found that only roughly a third of Bunz users accepted tokens even at the height of BTZ token usage. This results reveal the empirical importance of partial money acceptance—a feature absent from most monetary models, including the Lagos-Wright (2005) workhorse, with only a few exceptions (e.g., Shevchenko and Wright 2004). There were also temporary fluctuations in redemption volumes in response to monetary events that affected money supply. This finding reveals the importance of endogenous redemption dynamics, which is entirely absent from the search-theoretic literature.

To my knowledge, this paper is the first to use transaction-level microdata and natural experiments to study money and barter in the field. 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 babysitting in a co-op on the US Capitol Hill was averted by expanding the supply of scrip. Humphrey (1985) conducted an ethnography of barter among the Llomi of northeast Nepal, famously arguing that "[n]o example of a barter economy, pure and simple, has ever been described." To my knowledge, Colacelli and Blackburn (2009) provided the only existing quantitative field evidence by collecting survey responses during the 2002 Argentine crisis, finding that participation in fiat-issuing exchange clubs was associated with increased consumption among bartering populations in Argentina. The approach here enables a much higher resolution identification of the effects of monetary events in a real-world barter economy.

This paper also contributes to a growing literature on digital currencies. One strand shows that the use of digital payment systems increases consumption (e.g., Jack and Suri 2014; Beck et al. 2018; Xu, Ghose and Xiao 2024; Alvarez and Argente 2020*a*,*b*). Another strand studies currency runs (e.g., Iyer and Puri 2012; Iyer, Puri and Ryan 2016; Liu, Makarov and Schoar

2023). Yet another studies the adoption of digital payment systems (e.g., Crouzet, Gupta and Mezzanotti 2023; Alvarez et al. 2023). Since it is difficult to obtain data on barter in the field, existing studies generally only examine data on money-mediated transactions. Tests of theoretical models of money and barter using real-world microdata have been rare. The unique data and experiments studied here confirm the predictions of a search-theoretic model of redeemable money, while suggesting new avenues for theoretical development. New theoretical progress spurred by the evidence can improve the design of real-world currency systems, mitigate systemic risks, and increase gains from trade.

The remainder of 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 discusses microfoundations for persistent price rigidity, discrepancies between the framework and evidence, and implications for monetary economics.

2 Background

This section describes the history of the 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.³

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.⁴

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.⁵ 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.⁶

On the app, each user can post items for sale, maintain a public profile, which includes a short

³Similar communities have often emerged in the wake of economic crises. For example, barter and private currencies both 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).

⁴A 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.

⁵See Bunz FAQ in Appendix A.1.

⁶Interviews with app users in May 2019 revealed a range of opinions about the ban on cash transactions among users. Many interviewees, especially those 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.

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 Figures A1, A2, and A3 show 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 trade on the Bunz app. Interviews with users reveal that trades 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 trade through alternative payments such 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 trade and directly consumed or used by the seller soon after the trade. Such offers were occasionally rejected 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. Trade was almost always bilateral and simultaneous.⁷ 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.

⁷Credit 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.

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 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 and restaurants, at a fixed exchange rate of 100 BTZ to 1 Canadian dollar (CAD).⁸ 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 buy nor sell BTZ for cash in the Bunz app. As such, the total supply of tokens in the app was strictly determined by token issuance by the app and token redemption by users at local stores. Appendix Figure A4 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 trade, which allows me to identify barter trades. In addition, I observe all items that users post, along with descriptions and timestamps. The full text of the messages that one user sent to one another is also available. For each user, I observe a rich set of characteristics, including user geolocation and answers to the "Daily BTZ Drop" surveys, which

⁸In 2018, the average exchange rate was 1 CAD to 0.77 USD.

ask for information such as demographics.

Despite their richness, these data have some limitations. First, the items traded on the platform are typically used and highly non-standardized. Moreover, barter trades 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 trades, as measured by ratings sent and received, rather than the terms of trade. Second, there is no centralized exchange between BTZ and other currencies. As explained further below, I measure the BTZ price level using a subset of gift cards that are posted on the platform that feature both a face value in Canadian dollars and a 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 A5).

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 trades on the platform. In the regression analysis below, I focus on *regular users*—users who have at least 50 trades during the entire sample period, have at most 70% of trades concentrated in one month, and were active for at least 6 months. Between September 2018 and August 2019, regular users accounted for 1 percent of active users, but 48 percent of trades as measured by ratings sent and received, 36 percent of items posted, and 40 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 90 percent of regular users sent a message to another user (see Appendix Figure A6). To analyze effects of monetary events, changes in user activity will be measured both in aggregate, as well as for sub-samples of regular users, such as subsets with different levels of trade intensity. The main results are robust to restricting to these

subsets and hence are not entirely attributable to changes in user composition.9

3 Theoretical Framework

This section provides a simple search-theoretic framework for thinking about the Bunz economy. Specifically, the canonical Kiyotaki-Wright (1993) model of money is extended to feature redemption and issuance. The model assumes that prices are rigid. It predicts that: (1) monetary expansion increases trade volume but reduces money velocity, and (2) reduced redeemability reduces money acceptance, money velocity, and trade volume. As argued below, the model explains this paper's main empirical findings. Section 7 discusses microeconomic foundations, related theories, and some discrepancies between the model and the data.

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 trade 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.¹⁰

⁹Appendix Table A3 shows that frequent users have broadly similar activity profiles as less frequent users. The barter share of trades, level of token acceptance, offer messages sent per trade completed, and mean size of BTZ flows are similar for users with different levels of total trade volumes. Frequent users, however, receive fewer tokens from the platform, redeem fewer tokens, and post fewer items per trade completed.

¹⁰Rupert et al (2000) provide a micro-foundation for this assumption.

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 exchange for the other's commodity.

The Bellman equations are as follows:

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

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

where V_1 is the value of holding one unit of money while 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 A8 provides a graphical illustration of the state transitions.

3.2 Equilibrium

Following Wright (1999), symmetric evolutionarily stable steady-state Nash equilibria are considered.¹¹ 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

¹¹This focus rules out the mixed equilibrium in Kiyotaki and Wright (1993), which the prior literature has shown to not be robust.

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:

$$\pi_{j} = \begin{cases} 1 & > 0 \\ \in [0,1] \iff \Delta_{j} \begin{cases} > 0 \\ = 0 \\ < 0, \end{cases}$$
(3)

where

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

$$\Delta_1 = \frac{(r+\sigma+\alpha x(1-y)M\pi)(u-c)+(r+\sigma)c}{r+\rho+\sigma+\alpha x(1-y)\pi}.$$
(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 trade volume is given by $T_B = \frac{1}{2}\alpha xy$, while peer-to-peer monetized trade volume is given by $T_M = (1 - M)M\alpha x(1 - y)\pi$. Total peer-to-peer trade 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 $W = \frac{1}{r} [(u - c)\varphi + uM\rho]$.

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 trades remain 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 trade volume increases;
- 3. Barter trade 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 monetized 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 trade volume decreases;
- 3. Barter trade volume is unchanged; and
- 4. Both peer-to-peer and redemption token velocity decrease.

4 Effects of Monetary Expansion

This section tests Prediction 1 by estimating the effects of a large monetary expansion on trade behavior on the Bunz platform. Consistent with the model, it is found that monetary expansion did not detectably affect token prices, token acceptance, or barter trade volume, but instead increased token-mediated trade volume and reduced token velocity.

4.1 Token Issuance, Redemption, and Supply

To measure the impact of the monetary expansion, my analysis begins by documenting trends in token issuance, redemption, and supply. As shown in Figure 1, a large monetary expansion occurred in September and October 2018 (Weeks 36-42), roughly half a year after the initial introduction of the token.¹² During these weeks, 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. However, after roughly eight weeks of increased token issuance, Bunz HQ realized that the resulting pace of token redemption

¹²A smaller wave of token issuance also took place six months earlier, in April (Week 15), when each user who activated their BTZ wallet received 1000 BTZ (which is equivalent to 10 CAD).





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.

would be financially unsustainable, and reverted to Daily BTZ Drops of 10 BTZ per day.¹³ The orange line in Figure 1 Panel (a) plots weekly issuance, defined as the sum of tokens transferred from Bunz HQ to users, excluding local stores and Bunz employees.

Despite the sharp increase in issuance, token redemption did not increase proportionally. 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 in token redemption after the initial BTZ introduction. From October to December 2018, there was another wave of heightened token redemption, after monetary expansion. However, after Christmas Day that year, BTZ redemption fell back toward its initial level.

Since issuance greatly exceeded redemption, token supply persistently 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 tokens in circulation stabilized at roughly 20

¹³As 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 2: Token price, all available data

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.

million BTZ (equivalent to 0.2 million CAD). BTZ supply grew rapidly in September 2018 due to increased token issuance, but stabilized after November 2018 at a level of roughly 100 million BTZ (equivalent to 1 million CAD).

4.2 Token Price, Acceptance, and Velocity

The impacts of monetary expansion on token price, acceptance, and velocity are next analyzed. Consistent with Prediction 1, it is shown that (1) token prices were stable, (2) token acceptance was stable, and (3) token velocity fell in response to the fivefold increase in token supply.

To measure the token price, I focus on store gift cards that are frequently transacted on the platform. I then take the ratio of their posted BTZ price to their dollar-denominated face value.¹⁴ Since BTZ was 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 shows that the token price remained anchored to the fixed exchange rate of the token

¹⁴Specifically, 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.

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 the relative token price for all available gift card postings 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 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.

Figure 3 Panel (a) shows that token acceptance did not change discontinuously during the monetary expansion. To measure token acceptance, the share of items posted with a BTZ price is used, 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.

The share of user token expenditure used for redemption (instead of peer transfers) also stayed stable around 35 percent (see Appendix Figure B1 Panel (a)), confirming that monetary expansion

did not meaningfully alter beliefs about the value of the token.

However, token velocity—the speed at which token change hands—persistently fell at the end of 2018, roughly two months after the monetary expansion. This finding is consistent with Prediction 1, which predicts that monetary expansion reduces token velocity. 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 lower levels of 1.7 and 0.75 times per year, respectively.

4.3 Barter and Token-mediated Trade

The effects of monetary expansion on real trade outcomes are now reported. Consistent with Prediction 1, it is found that token-mediated trade volume dramatically increased, and that barter trade volume did not change. These effects are robust to controls for user fixed effects, seasonality, and time since entry. They coincided with increases in both items posted and offer messages sent on the platform.

To measure trade volume, the ratings that users provide each other are counted. This measure is the closest available proxy for the volume of goods exchanged on the bartering app, since trades occur offline and are not directly recorded. The value of goods traded is also difficult to know, since barter trades are not associated with any prices, and the goods are typically used and highly heterogeneous. This measure is likely an underestimate of the actual trade volume, as users may not always provide a rating for their trade partner upon completion of a trade. Nevertheless, the measure is likely to be highly correlated with completed trade. Most importantly, these data are available both before and after the introduction of BTZ, whereas token trades are only available after token introduction. Trade volumes are then decomposed into barter and token-mediated trades based on whether a token transfer occurred between the same pair of users within 7 days of the user rating.

Figure 4 shows that, at the aggregate level, the monetary expansion dramatically increased trade volume. In the two years before the introduction of BTZ, the total peer-to-peer trade volume was largely stable. After the introduction of BTZ in April 2018, there was a small dip in completed

Figure 4: Effect of monetary expansion on trade volume



Notes: Figure shows the weekly trend in the number of peer-to-peer trades, as measured by user reviews. Barter traders are the subset of trades that did not coincide with a token transfer between the same user pair within 7 days. Gray bars indicate the first and second wave of monetary expansion.

trades. This dip is likely to be driven by seasonal trends, as a dip of similar magnitude was seen during the year before. After the monetary expansion in September 2018, there was a large and persistent increase in the number of trades completed.

However, monetary expansion did not change the overall level of barter trades. The rise in total trade volume is instead accounted for by the emergence of token-mediated trades. These token-mediated trades began to emerge almost immediately following BTZ introduction, but substantially grew during the monetary expansion.

Was the increase in trade driven by increases at the user level or changes in user composition? Table 1 provides a statistical analysis using an interrupted time series design at the user level. Specifically, I construct a monthly panel of regular users, spanning two years prior to the monetary expansion until one year after. I then regress:

$$y_{it} = \beta PostExpansion_t + \delta_i + \delta_{c(t)} + \gamma \times (t - \tau(i)) + \varepsilon_{it}, \qquad (6)$$

	(1) (2) Asinh total trades		(3) (4) Asinh barter trades	
Post expansion	0.296**	0.199**	0.028	-0.048*
	(0.023)	(0.028)	(0.022)	(0.027)
Calendar-month FE		Х		Х
Observations	49942	49942	49942	49942
Users	1815	1815	1815	1815
R^2	0.293	0.299	0.303	0.308
Pre-event mean	1.232	1.232	1.207	1.207

Table 1: Effects of monetary expansion on existing regular users

Notes: Table reports the effects of monetary expansion on the asinh total trades and asinh barter trades of existing regular users. Sample includes all observations between October 2016 and September 2019 at the month-user level for regular users whose first message sent was before the monetary expansion. "Post expansion" is defined as months after September 2018. Controls for user fixed effects and months after user entry are included. Controls for calender month fixed effects are added in Columns (2) and (4). Standard errors are clustered at user level. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

where y_{it} indicate user-level outcomes, $PostExpansion_t$ indicates months after September 2018, δ_i are user fixed effects, $\delta_{c(t)}$ are calendar month fixed effects, $t - \tau(i)$ is time since user entry, and ε_{it} is an error term. β recovers the causal effect of monetary expansion on user-level outcomes under the assumption that user outcomes would have followed the same trajectory as previous entry cohorts in the absence of monetary expansion. Standard errors are clustered at the user level.

The estimates reveal that the increases in trade were substantially driven by increases within users. Column (1) shows that the effect of monetary expansion on total trades remains positive and statistically significant, at 29.6 asinh points, after controlling for user fixed effects and time since entry. Column (2) shows that the increase is attenuated but still significant, at 19.9 asinh points adding controls for seasonality. Columns (3) and (4) show that barter trades did not significantly change even after controlling user fixed effects, time since entry, and seasonality. These results are similar with more flexible controls for the time since user entry (Appendix Table B1), as well as for users with different levels of activity intensity (Appendix Table B2).

The estimated causal effects of monetary expansion are very unlikely to be spurious, since

trends in trade volumes were highly stable for at least a year before sharply changing during the monetary expansion. The trends in token flows, token acceptance, trade volumes, offer messages sent, and items posted were also highly similar for users with different trade intensity (Appendix Figures B1, B2, B3, and B4).

What explains the increase in trade? Offers messages sent and items posted both responded substantially and positively to monetary expansion, even after controlling for user fixed effects and time since entry, and for users with different trade intensities (Appendix Tables B3 and B4). The aggregate number of offer messages sent increased by 41%, while the number of trades completed per offer message increased only by 11% (Appendix Figure B5). These findings suggest that trade initiation greatly increased, while bargaining success upon contact increased more mildly.

5 Effects of Reduced Redeemability

This section tests Prediction 2 by estimating the effects of reduced redeemability on transaction behavior on the Bunz platform. Consistent with the model, no change in token prices was detected, but reduced redeemability caused token acceptance and transaction volume to persistently decline. Moreover, barter transactions declined, partly due to reduced user entry. There was also a spike in redemption volume, as users attempted to spend down their token balances. These findings suggest the presence of partial acceptance, endogenous redemption choices, and coordinated retaliation against the platform's breach of trust. These factors are absent from the conceptual framework and will be discussed in Section 7.

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 C.1).

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.¹⁵

Local news widely reported that users were angry that the platform reneged on its promise of redemption.¹⁶ Many Bunz Facebook administrators also announced that they would sever their affiliation with Bunz.¹⁷

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".

¹⁵Appendix C.2 provides the full text. The digital wallets of employees were also suddenly locked (Galang 2019).

¹⁶One 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).

¹⁷As shown in Appendix C.3, 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."

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.¹⁸

5.2 Token Redemption and Supply

This subsection measures the impact of reduced redeemability on token redemption and supply using transaction-level data. Redemption is found to have immediately spiked after redeemability was reduced, but the magnitude of this temporary spike in redemption was small relative to the token supply. The endogenous redemption dynamics observed here are not predicted by the conceptual framework, but can be rationalized by extensions, as discussed in Section 7.

The light lines in Figure 5 Panel (a) show 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. The overall level of token redemption declined by 31% after reduced redeemability, but increased among regular users.

¹⁸Appendix E provide the transcript of this interview.

Figure 5: Token supply, before and after reduced redeemability



Notes: Panel (a) shows the trend in BTZ issuance, defined as the total amount of tokens sent from Bunz directly to users, and the trend in BTZ redemption, defined as total amount of tokens sent from users to local stores. Panel (b) shows the trend in BTZ supply, defined as 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, unusual activity is removed by excluding users who received sign-up bonus and only made redemption during the spikes, excluding stores that cooperated with these users, and performing 0.1% winsorization to remove extreme values.

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.

Interestingly, the increase in redemption was not only much larger in the short term, but also for frequent users. Appendix Figure C1 plots the trend in token flows within subgroups of users with different total trades, showing that token redemption was broadly stable prior to the reduction and increased more for frequent users immediately thereafter.

Table 2 estimates the impact of reduced redeemability on existing regular users using an interrupted time series design at the user level. I construct a weekly panel of regular users, spanning 11

	(1) Asinh token redemption	(2) Token acceptance	(3) Asinh token- mediated trades	(4) Asinh barter trades
First four weeks	0.382**	-0.075**	0.001	-0.015*
	(0.039)	(0.008)	(0.007)	(0.008)
After four weeks	0.158**	-0.058**	-0.052**	-0.080**
	(0.041)	(0.012)	(0.009)	(0.012)
Observations	50307	22795	50307	50307
Users	2072	2072	2072	2072
R^2	0.242	0.584	0.306	0.363
Pre-event mean	0.305	0.401	0.183	0.306

Table 2: Effects of reduced redeemability on existing regular users

Notes: Table reports the effects of reduced redeemability on the asinh token redemption, token acceptance, asinh token-mediated trades and asinh barter trades of existing regular users. Sample includes all observations between week 26, 2019 and week 51, 2019 at the week-user level for regular users whose first message sent was before the reduction. "First four week" indicates the first four week after week 37, 2019, and "After four weeks" indicates the weeks thereafter. Controls for user fixed effects and weeks after user entry are included. Standard errors are clustered at user level. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

weeks before the reduction until 15 weeks after, and regress:

$$y_{it} = \beta_0 PostSR_t + \beta_1 PostLR_t + \delta_i + \gamma \times (t - \tau(i)) + \varepsilon_{it},$$
(7)

where y_{it} indicate user-level outcomes, $PostSR_t$ indicates the first four weeks after redeemability was reduced, $PostLR_t$ indicates more than four weeks after redeemability was reduced, δ_i are user fixed effects, and ε_{it} is an error term. Standard errors are clustered at the user level.

Column (1) shows that token redemption increased on average by roughly 40 percent in the short-run and by roughly 16 percent in the long-run among existing frequent users, even after controlling for user fixed effects and time since entry. These conclusions are not confounded by the presence of pre-event trends (Appendix Figure C2) and are highly robust to more flexible controls for time since entry (Appendix Table C1). The finding that the increase in redemption was much larger for frequent users is also robust to adding user fixed effect and time since entry

controls (Appendix Table C2).

5.3 Token Price, Acceptance, and Velocity

The impacts of reduced redeemability on token price, acceptance, and velocity are now documented. Consistent with Prediction 2, it is found that after redeemability was reduced, (1) token prices were stable, (2) token acceptance immediately fell, and (3) token velocity fell after some initial increase.

Figure 2 shows that there was no detectable change in token prices. Despite reduced redeemability, the token price—as measured using gift cards posted on the platform—remained anchored to the exchange rate of the token redemption program.

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.¹⁹ Appendix Figure C3 confirms that the magnitude of the reduction in token acceptance was broadly stable for users with different trade frequency prior to the reduction, but fell across the board thereafter.

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.

Table 2 Column (2) reports regression coefficients for Equation (7). It is shown that token acceptance fell by 6-7 p.p. among existing regular users, conditional on their posting new items,

¹⁹Appendix C.4 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."





Notes: Figures shows the trends 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, unusual activity is removed by excluding users who received sign-up bonus and only made redemption during the spikes, excluding stores that cooperated with these users, and performing 0.1% winsorization to remove extreme values.

even after controlling for user fixed effects and time since entry. The decline is unconfounded by the presence of pre-event trends (Appendix Figure C2), highly robust to flexible controls for time since entry (Appendix Table C1), and similar for users of different trade intensities (Appendix Table C2).

5.4 Barter and Token-mediated Trade

This subsection turns to the impact of reduced redeemability on real trade. Consistent with Prediction 2, it is found that (4) token-mediated trade volume fell. However, contrary to Prediction 2, I find that (5) barter trade volume fell. The drop in barter volume coincided with a broad reduction in user activity on the platform. These findings confirm that users orchestrated a coordinated retaliation against the platform in response to its breach of promise.

Figure 7 shows that token-mediated transactions persistently fell by 32%. Before redeemability was reduced, 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

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.

to decline gradually, falling to a lower but stable level one month after the announcement.

More surprisingly, barter transactions also persistently fell by 23%. Before the reduction in redeemability, barter transaction volume was largely stable. Immediately after the announcement, it began to fall, with a trend break around the date of the announcement, and stabilizing at lower level roughly a month later. This finding contradicts Prediction 2, which suggests that barter should not be affected. It also contrasts with the findings in Section 4, since monetary expansion was found to not affect barter volumes.

The trends in trade volumes are highly similar for users with different trade intensity (Appendix Figure C4). However, the declines are smaller among existing users compared to the aggregate decline. Table 2 Columns (3)-(4) show that token-mediated and barter trade both fell, even after controlling for user fixed effects and time since entry. The average longer-run decline is roughly 5.2 and 8.0 percent for token-mediated and barter trades, respectively. The declines are persistent and

unconfounded by the presence of pre-event trends (Appendix Figure C5), robust to more flexible controls for time since entry (Appendix Table C3), and are statistically significant within subgroups of users with different trade intensities (Appendix Table C4).

Other platform activity outcomes also persistently fell as a result of reduced redeemability, including the overall levels of items posted, offer messages, and trades per offer (see Appendix Figures C6 and C7). These declines are robust to controls for user fixed effects and time since entry controls, and are substantial among subgroups with different trade intensity (see Appendix Figure C8 and Appendix Tables C5 and C6).

Why did barter volumes drop, and why was the individual-level reduction in trade volumes among existing users smaller than the aggregate reduction? One potential reason is that the widely reported fury of aggrieved users damaged the reputation of the platform, thereby reducing the flow of new users onto the platform. Consistent with this channel, Appendix Figure A7 shows that the entry of regular users fell sharply after redeemability was reduced. Microeconomic foundations for the coordinated retaliation are discussed in Section 7.

6 Effects of Redemption Halt

This section provides a second test for Prediction 2 by estimating the effects of the final halt of redemption by Bunz HQ on trade. Consistent with theory, I find no adjustment in token prices, an immediate reduction in token acceptance, and a more gradual reduction in token-mediated trade volume. After the Covid lockdown, a full recovery of barter was found, suggesting that unlike the first reduction in redeemability, the long-term damage was limited to token-mediated trade.

6.1 Timeline of Events

The final halt in the redemption was caused 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. Unlike the partial reduction in redeemability, the platform said that the complete halt in redemption was due to technical difficulties and would 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 D.1). This wording was likely 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-term impact of the end of redemption 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 (TTC Board 2020). On March 17, Ford declared a state of emergency in Ontario and orders business including daycares, bars and restaurants, theaters 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 (Nielsen 2020).

6.2 Token Price, Acceptance, and Velocity

The high-frequency nature of the data enables me to distinguish the effect of redemption halt from the effects of the Covid-19 pandemic. The impacts of the redemption halt on token price, acceptance, and velocity are first analyzed. Consistent with Prediction 2, the redemption halt was found to result in an immediate and permanent fall in token acceptance and velocity. However, as assumed in the model, there was no detectable change in token prices even after redemption was halted, as shown in Figure 2.

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.





Notes: Figure shows the trend in BTZ issuance, defined as the total amount of tokens sent from Bunz directly to users, and BTZ redemption, defined as the 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.

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.²⁰ Appendix Figure D1 confirms that the decline in token acceptance is highly similar for regular users with different trade intensities.

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

²⁰As 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 9: Token acceptance and velocity, before and after redemption halt

Notes: Figure shows the trends 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.

ended, before it gradually fell again. Appendix Figure D2 shows that the trends in token issuance, redemption, inflows, and outflows were similar for regular users with different trade intensities.

Table 3 estimates the impact of the halt on existing regular users using an interrupted time series design at the user level. Specifically, I construct a weekly panel of frequent users, spanning the 20 weeks before the event until 34 weeks after. I then regress:

$$y_{it} = \beta_0 PostHalt_t + \beta_1 Covid_t + \beta_2 PostCovid_t + \delta_i + \gamma \times (t - \tau(i)) + \varepsilon_{it},$$
(8)

where y_{it} indicate user-level outcomes, *PostHalt*_t indicates the two weeks during and after the halt, *Covid*_t indicates the weeks of Covid lockdown, *PostCovid*_t indicates the weeks after lockdown, δ_i are user fixed effects, $\tau(i)$ is *i*'s time of user entry, and ε_{it} is an error term. Standard errors are clustered at the user level.

Column (1) confirms that token acceptance among existing frequent users fell immediately, by 4 p.p., conditional on posting items, even after controlling for user fixed effects and time since entry. Moreover, token acceptance among existing users did not recover. Appendix Figure D3 reports week-by-week coefficients, confirming the complete absence of pre-event trends and a sharp drop in token acceptance, which then deepened over time. This finding is robust to more

	(1) Token acceptance	(2) Asinh token- mediated trades	(3) Asinh barter trades
Post halt	-0.040**	-0.015**	-0.038**
	(0.009)	(0.006)	(0.008)
Post covid	-0.101**	-0.065**	-0.054**
	(0.012)	(0.008)	(0.013)
Observations	38121	96899	96899
Users	2072	2072	2072
R^2	0.528	0.215	0.288
Pre-event mean	0.326	0.149	0.263

Table 3: Effects of redemption halt on existing regular users

Notes: Table reports the effects of the redemption halt on the token acceptance, asinh token-mediated trades and asinh barter trades of existing regular users. Sample includes all observations between week 41, 2019 and week 42, 2020 at the week-user level for regular users whose first message sent was before the halt. "Post halt" indicates the first two week after week 9, 2019, "Covid" indicates the weeks between week 11, 2020 and week 23, 2020, and "Post Covid" indicates the weeks thereafter. Controls for user fixed effects and weeks after user entry are included. Standard errors are clustered at user level. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

flexible controls for time since user entry, as well as similar for users with different levels of activity intensity (see Appendix Table D1 and D2). The immediate impact on token acceptance strongly suggests a causal interpretation. This finding is directionally consistent with Prediction 2.

6.3 Barter and Token-mediated Trades

The impacts of redemption halt on real trade outcomes are now reported. Consistent with Prediction 2, the redemption halt was found to result in a long-term decline in token-mediated trade volume. Moreover, unlike the first reduction in redeemability, the aggregate level of barter exchange did not persistently decline in the long term. The latter finding suggests the absence of coordinated retaliation against the platform.

The dashed blue line in Figure 10 shows a decline in token-mediated trades in the weeks following the redemption halt. This gradual decline was interrupted by the arrival of the Covid pan-





Notes: Figure shows the daily trend in the number of peer-to-peer trades 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.

demic, which led trades to dramatically fall, to less than one fifth of the pre-halt level. As the Covid lockdown eased over the next few months, however, token-mediated trades substantially recovered, reaching in June roughly two-thirds of the level prior to the redemption halt. However, token-mediated trades soon began to decline again. By the end of 2020, it was only one-third of the pre-halt level.

Interestingly, even though token-mediated trade persistently declined, barter trade did not. The solid red line in Figure 10 shows that, after Covid restrictions lifted in May 2020, barter trades returned to the same level prior to the full halting of redemption. It then remained highly stable at that level. This result contrasts with our findings in Section 5, where it was found that barter trade persistently fell after the initial reduction in redeemability, in part due to a dramatic reduction in the entry of regular users. After the final halt, there was instead little entry of regular users both before and after the halt in redemption (Appendix Figure A7).

Similar recoveries in barter trade after the Covid lockdown ended are documented among subsets of users with different trade intensity (Appendix Figure D4). The levels of items posted and offer messages sent were found to have recovered, though not fully (see Appendix Figures D5). Trades per offer were also found to have fully recovered (Appendix Figure D7).

These findings suggest that, unlike the first reduction in redeemability, the final redemption halt caused less long-term damage to barter trade on the platform. A plausible explanation for this difference is that this time the platform had promised that the halt would be temporary, and users were subsequently distracted by Covid, so less reputational damage was done.

Table 3 Columns (2) and (3) show that token-mediated and barter trades both fell among existing regular users in the longer run, after controlling for individual fixed effects and time since entry (see also Appendix Table D3). Moderate long-run declines in items posted and offer messages sent were also detected after controlling for user fixed effects and time since entry (see Appendix Figure D6 and Appendix Table D4). However, these regression estimates are likely to be somewhat confounded. Appendix Figure D8 shows some fluctuations in trade volumes, items posted, and offer messages in the preceding weeks, suggesting some confounding influences even in the short run. The long-run estimates are also confounded by the arrival of the Covid pandemic, which may account for some of the detected changes in behavior.

7 Discussion

This paper tested the predictions of a search-theoretic model of redeemable money using detailed and high-frequency data covering the rise and fall of a real-world redeemable digital currency in a contemporary barter economy. As predicted by the model, an unexpected five-fold increase in money supply was found to have persistently increased trade. Sudden and unanticipated reductions in money redemption were also found to have sharply reduced money acceptance and trade. This section discusses microfoundations for the observed price rigidity, discrepancies between the model and the evidence, and implications for monetary economics.

Why did posted token prices fail to adjust after the end of token redemption? A plausible explanation is that the Bunz economy lacked a mechanism for price coordination. Prior litera-
ture has shown that persistent price coordination failures can arise in economies with indivisible goods and decentralized price posting (Green and Zhou 1998, 2002; Zhou 2003; Kamiya and Sato 2004; Kamiya, Morishita and Shimizu 2005; Kamiya and Shimizu 2006, 2007*a*,*b*, 2011; Jean, Rabinovich and Wright 2010; Stanislav 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.²¹ Recent lab evidence also shows that

Comparing theory and evidence. Although the data are consistent with the main predictions of the model, there are some discrepancies that suggest potential avenues for further theoretical development. First, token acceptance in the Bunz economy was partial. 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, partial acceptability is largely ignored in recent New Monetarist literature (cf. Shevchenko and Wright 2004).²³

Second, endogenous redemption dynamics were found. After the first reduction in redeemability, there was a temporary increase in token redemption. The magnitude of the increase in the volume of redemption varied between agents. The model developed above assumes that the rate of redemption is fixed, so it cannot rationalize the presence of heterogeneous redemption dynamics among agents. To better explain the evidence, New Monetarist models with agent heterogeneity and endogenous redemption dynamics are needed.

Third, community enforcement of redemption promises was detected. The initial reduction in redeemability was heavily criticized in the press by aggrieved users, leading to persistently

 $^{^{21}}$ Han et al. (2016) show that equilibrium determinacy is restored in models with indivisible goods and either competitive search or efficient bargaining.

²²Jiang, Puzzello and Zhang (2023) find that monetary expansion leads to inflation in an environment where subjects observe the full history of market prices. Duffy and Puzzello (2022) find a lack of inflation or deflation in response to changes in money supply in an environment where subjects do not observe inflation or prices outside of their match.

²³Kiyotaki 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. In the workhorse Lagos-Wright (2005) framework, there are only equilibria where agents either all accept or all do not.

lower user entry and barter volumes. The second reduction in redeemability was promised to be temporary and received much less public attention; it did also not lead to a decline in entry or barter trade. These findings support institutionalist views that emphasize the presence of social contracts involving credit originators in the proper governance of monetary systems (Graeber 2011; Schnabel and Shin 2018; Borio 2019; Gorton and Zhang 2023). Theoretical models in which redeemable currency issuers are disciplined by the threat of reputational damage are needed to make sense of them (e.g., Kehoe and Levine 1993; Gu et al. 2013a,b).²⁴

Fourth, BTZ was found to be accepted after redemption was halted. This finding corroborates theoretical and laboratory results showing that currencies that were once functional can continue to circulate after becoming unbacked fiat (Duffy and Ochs 2002; Selgin 2003). It is also consistent with case studies on the Swiss dinar in Iraq (Foote et al. 2004; King 2004) and the Somali shilling (Luther 2015; Luther and White 2016). However, the transaction-level field data here reveal that BTZ circulated at a *lower* rate after redemption stopped, suggesting that unbacked fiat money functions less well. The data also reveal gradual reductions in acceptance after an immediate but partial reduction in acceptance, suggesting learning dynamics that are absent in existing models.

Implications for monetary economics. Monetary economics has made significant strides by simulating money and barter in theoretical models and in controlled laboratories. Yet, critics have long contended that the formal economic approach suffers from a lack of grounding in real-world evidence. This paper uses newly available field data on money and barter to build a stronger bridge between theory and evidence. The basic premise in montary economics that money overcomes the inefficiencies of barter was found to be supported. The predictions of a search-theoretic model of redeemable money were verified. Some new avenues for theoretical development were uncovered. In bridging the theory-evidence gap, this work affirms the usefulness of the formal economic approach for understanding the behavior of real-world currencies and underscores its potential for improving the future of money itself.

²⁴For example, the platform may earn rents from seigniorage, transaction fees, or advertising sales. If the platform reneges on its promise, agents can punish the platform by leaving or tarnishing its reputation. 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.

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Appendix

A Descriptive Evidence

A.1 Bunz FAQ (April 6, 2016)



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 <u>Bunz Trading Zones</u>. 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 <u>Bunz blog</u> 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 forgel, 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 <u>app</u>, 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: <u>HERE</u> 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 @<u>bunztradingzone</u>/Instagram@<u>bunztradingzone</u>/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.

A.2 Screenshots of the Bunz Mobile App

Figure A1: App interface before introduction of BTZ



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 A2: App interface after introduction of BTZ



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

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Wor time Hi	n maybe 3 is. Comes	n mine?		SUNLAMP For the SAD Iseasonal depression) al			Fun little zip Made of eclaimed juice poxes and per	-
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Figure A3: Examples of in-app message exchanges

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



Figure A4: Illustration of token and goods flow in the Bunz economy



Figure A5: User demographics: Survey responses

Source: User response from BTZ drop survey.

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
Gift cards	0.6%	21.9%	7.5	28.8	100
Video games	0.6%	34.0%	4	15	90
Pets	0.5%	32.7%	2	8	35
Uncategorized	26.5%	31.9%	1.5	8	40
Total Items	1129440				

Table A1: Summary statistics, item posted, by category

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.

	All users	Regular users	Percentage
	(1)	(2)	(3)
Trades	12202	5881	48.2%
Barter trades	7525	3520	46.8%
Token-mediated trades	4676	2361	50.5%
Items posted	95212	34649	36.4%
Token acceptance	.35	.41	
Offer messages sent	175521	75138	42.8%
Offer messages received	175655	56267	32%
BTZ flows			
Issuance	150260	20981	14%
Redemption	72004	17715	24.6%
Transfer from peer	143955	57219	39.7%
Transfer to peer	143955	53666	37.3%
BTZ volume per flow			
Issuance	.32	.25	
Redemption	17.18	24.09	
Transfer from peer	15.1	15.14	
Transfer to peer	15.1	15.44	
Number of users	215271	2281	1.1%

Table A2: Total monthly activity, all and regular users

Notes: This table displays total monthly activity, averaged between September 2018 and August 2019, for all and regular users, respectively. All BTZ numbers are denominated in the Canadian dollar (CAD) at the fixed exchange rate: 1 CAD = 100 BTZ.





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

Variables	10-49	50-99	100-199	200+		
	(1)	(2)	(3)	(4)		
Barter trades	.61	.6	.6	.6		
Token-mediated trades	.39	.4	.4	.4		
Items posted	7.09	6.24	5.92	5.08		
Token acceptance	.37	.41	.43	.4		
Offer messages sent	13.05	11.85	13.67	12.89		
Offer messages received	12.2	10.55	9.59	7.25		
Number of BTZ flows per trade						
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		

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

Notes: This table displays the average of different trade volumes between September 2018 and August 2019 for users separately grouped by their lifetime trades, 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. Sample excludes users who made less than five trades during the analyzed subperiod, who conducted more than 70% of their trades in a single month, or who were active for less than 6 months.

Figure A7: Regular user entry onto Bunz platform



Notes: This figure shows the trend in new entry of regular users, as measured by the first message sent.





B Effects of Monetary Expansion

Figure B1: Redemption share of expenditure and token acceptance, before and after monetary expansion, by user trade intensity



(a) Redemption share of expenditure

Notes: Figure shows the trends in (a) share of token expenditure used on redemption and (b) token acceptance as measured by the share of items posted with a BTZ price of users, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event, defined as week 36, 2017 to week 35, 2018. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded.



Figure B2: Token flows, before and after monetary expansion, by user trade intensity

(a) Token issuance

(b) Token redemption

Notes: Figure shows the trends in (a) token issuance, (b) redemption, (c) outflow to peers, and (d) inflow from peers, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event, defined as week 36, 2017 to week 35, 2018. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded.



Figure B3: Total and barter trades, before and after monetary expansion, by user trade intensity

Notes: Figure shows the trends in (a) total trades, and (b) barter trades, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event, defined as week 36, 2017 to week 35, 2018. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded.

	(1)	(2)	(3)	(4)	(5)	(6)	
	As	Asinh total trades			Asinh barter trades		
Post expansion	0.296**	0.269**	0.273**	0.028	-0.003	0.000	
	(0.023)	(0.024)	(0.025)	(0.022)	(0.022)	(0.023)	
Controls for time	Linear	Splines	FEs	Linear	Splines	FEs	
since entry:		~ [
<i>R</i> ²	0.293	0.297	0.305	0.303	0.310	0.317	

Table B1: Effects of monetary expansion on trade volumes among existing regular users, alternative controls for time since entry

Notes: Table reports the effects of monetary expansion on the asinh total trades and asinh barter trades of existing regular users, but uses different controls for month since entry. "Linear" refers to linear controls. "Splines" refers to 3-month linear splines. "FEs" refers to fixed effects for each month after entry.

	(1) As	(2) sinh total tra	(3) ades	(4) Asi	(5) inh barter tra	(6) des
Post expansion	0.284**	0.329**	0.290**	0.049*	0.017	-0.063
	(0.028)	(0.049)	(0.078)	(0.026)	(0.046)	(0.077)
Subsample	50-99 trades	100-199 trades	200+ trades	50-99 trades	100-199 trades	200+ trades
Observations	31278	13929	4735	31278	13929	4735
Users	1188	472	155	1188	472	155
R^2	0.164	0.162	0.244	0.172	0.186	0.250
Pre-event mean	0.979	1.461	2.171	0.956	1.432	2.134

Table B2: Effects of monetary expansion on trade volumes among existing regular users, alternative sub-samples with different trade intensities

Notes: Table reports the effects of monetary expansion on the asinh total trades and asinh barter trades of existing regular users, but uses different subsamples of users with different numbers of total trade in the available data, as measured by ratings received.



Figure B4: Items posted and offers sent, before and after monetary expansion, by user trade intensity

Notes: Figure shows the trends in (a) items posted on the platform and (b) offer messages sent, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the year before the event, defined as week 36, 2017 to week 35, 2018. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded.

	(1) Asinh ite	(2) ems posted	(3) Asinh offer n	(4) nessages sent
Post expansion	0.223**	0.089**	0.389**	0.250**
	(0.035)	(0.042)	(0.038)	(0.046)
Calendar-month FE		Х		Х
Observations	49942	49942	49942	49942
Users	1815	1815	1815	1815
R^2	0.305	0.309	0.418	0.422
Pre-event mean	2.435	2.435	3.187	3.187

Table B3: Effects of monetary expansion on items posted and offers sent among existing regular users

Notes: Table reports the effects of monetary expansion on the asinh items posted and asinh offer messages sent of existing regular users. "Post expansion" is defined as months after September 2018. Controls for user fixed effects and months after user entry are included. Controls for calender month fixed effects are added in Columns (2) and (4). Sample includes all observations between October 2016 and September 2019 at the month-user level for regular users whose first message sent was before the monetary expansion. Standard errors are clustered at user level. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

	(1) As	(2) inh items po	(3) osted	(4) Asinh	(5) offer messag	(6) ges sent
Post expansion	0.214**	0.282**	0.139	0.403**	0.413**	0.252**
	(0.044)	(0.069)	(0.107)	(0.048)	(0.072)	(0.111)
Subsample	50-99 trades	100-199 trades	200+ trades	50-99 trades	100-199 trades	200+ trades
Observations	31278	13929	4735	31278	13929	4735
Users	1188	472	155	1188	472	155
R^2	0.246	0.241	0.315	0.341	0.351	0.372
Pre-event mean	2.138	2.711	3.502	2.766	3.668	4.443

Table B4: Effects of monetary expansion on items posted and offers sent among existing regular users, alternative sub-samples with different trade intensities

Notes: Table reports the effects of monetary expansion on the asinh items posted and asinh offers sent of existing regular users, but uses different subsamples of users with different numbers of total trade in the available data, as measured by ratings received.



Figure B5: Offers vs. trades per offer, before and after monetary expansion

Notes: Figure shows the weekly trend in (a) offers messages sent and (b) trades per offer sent. Gray bars indicate the first and second wave of monetary expansion.

C Effects of Reduced Redeemability

C.1 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.

C.2 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 communityfocused 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

C.3 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

C.4 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.



Figure C1: Token flows, before and after reduced redeemability, by user trade intensity

Notes: Figure shows the trends in (a) token issuance, (b) redemption, (c) outflow to peers, and (d) inflow from peers, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the months before the event, defined as July 1 to September 9, 2019. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.

Figure C2: Effects of reduced redeemability on token redemption and acceptance among existing regular users, weekly estimates



Notes: Figure reports coefficients from regressions of (a) asinh token redemption and (b) token acceptance, with controls for user fixed effects and months after user entry. The sample includes only existing regular users. Standard errors are clustered at user level. 95% confidence intervals are shown.
Figure C3: Token acceptance and redemption share of expenditure, before and after reduced redeemability, by user trade intensity



(a) Redemption share of expenditure

Notes: Figure shows the trends in (a) token acceptance as measured by the share of items posted with a BTZ price of users and (b) share of token expenditure used for redemption, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the months before the event, defined as July 1 to September 9, 2019. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.

	(1)	(2) Asinh redemp	(3) tion	(4) To	(5) oken acceptano	(6) ce
First four weeks	0.382**	0.383**	0.381**	-0.075**	-0.075**	-0.076**
	(0.039)	(0.039)	(0.039)	(0.008)	(0.008)	(0.008)
After four weeks	0.158**	0.158**	0.155**	-0.058**	-0.059**	-0.059**
	(0.041)	(0.041)	(0.041)	(0.012)	(0.012)	(0.012)
Controls for time	Linear	Splines	FFs	Linear	Splines	FFs
since entry:	Linear	opines	1 123	Linear	opinies	1 1.5
R^2	0.242	0.242	0.245	0.584	0.584	0.589

Table C1: Effects of reduced redeemability on redemption and acceptance among existing regular users, alternative controls for time since entry

Notes: Table reports the effects of reduced redeemability on the asinh token redemption and token acceptance of existing regular users, but uses different controls for weeks since entry. "Linear" refers to linear controls. "Splines" refers to 3-month linear splines. "FEs" refers to fixed effects for each month after entry. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

	(1) As	(2) sinh redemp	(3) tion	(4) To	(5) ken acceptar	(6) nce
First four weeks	0.261**	0.484**	0.993**	-0.074**	-0.091**	-0.039**
	(0.041)	(0.079)	(0.213)	(0.011)	(0.015)	(0.018)
After four weeks	0.109**	0.162**	0.521**	-0.051**	-0.092**	-0.011
	(0.046)	(0.080)	(0.222)	(0.016)	(0.020)	(0.029)
Subsample	50-99 trades	100-199 trades	200+ trades	50-99 trades	100-199 trades	200+ trades
Observations	32547	13446	4314	13184	6684	2927
Users	1366	539	167	1366	539	167
R^2	0.195	0.217	0.383	0.556	0.606	0.674
Pre-event mean	0.256	0.315	0.644	0.400	0.411	0.382

Table C2: Effects of reduced redeemability on redemption and acceptance among existing regular users, alternative subsamples

Notes: Table reports the effects of reduced redeemability on the asinh token redemption and token acceptance of existing regular users, but uses different subsamples of users with different numbers of total trade in the available data, as measured by ratings received. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.



Figure C4: Barter and token-mediated trades before and after reduced redeemability, by user trade intensity

Notes: Figure shows the trends in (a) token-mediated trades, and (b) barter trades, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the months before the event, defined as July 1 to September 9, 2019. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.

Figure C5: Effects of monetary expansion on trade volumes among existing regular users, weekly estimates



Notes: Figure reports coefficients from regressions of (a) asinh token-mediated trades and (b) asinh barter trades on week fixed effects, with controls for user fixed effects and months after user entry. The sample includes only existing regular users. Standard errors are clustered at user level. 95% confidence intervals are shown.

	(1) (2) (3) Asinh token-mediated trades		(4) (5) (6) Asinh barter trades		(6) ades	
First four weeks	0.001	0.001	0.002	-0.015*	-0.015*	-0.012
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
After four weeks	-0.052**	-0.052**	-0.050**	-0.080**	-0.081**	-0.077**
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
Controls for time	Linear	Splines	FFe	Linear	Splines	FFe
since entry:	Linear	Spines	1 125	Lineai	Spines	1128
R^2	0.306	0.306	0.310	0.363	0.364	0.369

Table C3: Effects of reduced redeemability on trade volume among existing regular users, alternative controls for time since entry

Notes: Table reports the effects of reduced redeemability on asinh token-mediated trades and asinh barter trades of existing regular users, but uses different controls for weeks since entry. "Linear" refers to linear controls. "Splines" refers to 3-month linear splines. "FEs" refers to fixed effects for each month after entry. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

	(1) Asinh to	(2) oken-mediat	(3) ed trades	(4) Asi	(5) nh barter tra	(6) ndes
First four weeks	0.001	-0.001	0.011	-0.011	0.005	-0.104**
	(0.007)	(0.014)	(0.039)	(0.010)	(0.017)	(0.043)
After four weeks	-0.039**	-0.059**	-0.124**	-0.064**	-0.053**	-0.284**
	(0.010)	(0.020)	(0.046)	(0.013)	(0.023)	(0.057)
Subsample	50-99 trades	100-199 trades	200+ trades	50-99 trades	100-199 trades	200+ trades
Observations	32547	13446	4314	32547	13446	4314
Users	1366	539	167	1366	539	167
R^2	0.242	0.250	0.368	0.276	0.303	0.390
Pre-event mean	0.139	0.214	0.418	0.235	0.337	0.756

Table C4: Effects of reduced redeemability on trade volume among existing regular users, alternative sub-samples with different trade intensities

Notes: Table reports the effects of reduced redeemability on the asinh token-mediated trades and asinh barter trades of existing regular users, but uses different subsamples of users with different numbers of total trade in the available data, as measured by ratings received. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.





Notes: Figure shows the trends in (a) items posted and (b) offer messages sent, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the months before the event, defined as July 1 to September 9, 2019. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.



Figure C7: Offers sent vs. trades per offer, before and after reduced redeemability

Notes: Figure shows the trend in (a) offer messages (b) trades 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.

Figure C8: Effects of reduced redeemability on items posted and offer messages sent among existing regular users, weekly estimates



Notes: Figure reports coefficients from regressions of (a) asinh items posted and (b) asinh offer messages sent on week fixed effects, with controls for user fixed effects and months after user entry. The sample includes only existing regular users. Standard errors are clustered at user level. 95% confidence intervals are shown.

Table C5: Effects of reduced redeemabilit	ty on items posted a	nd offer messages ser	nt among existing
regular users, alternative controls for time	e since entry		

	(1) Asi	(2) inh items po	(3) sted	(4) Asinh ((5) offer messag	(6) ges sent
First four weeks	-0.088**	-0.087**	-0.077**	0.068**	0.068**	0.077**
	(0.022)	(0.022)	(0.023)	(0.024)	(0.024)	(0.024)
After four weeks	-0.183**	-0.182**	-0.171**	-0.123**	-0.122**	-0.112**
	(0.031)	(0.031)	(0.031)	(0.033)	(0.033)	(0.033)
Controls for time	Linear	Splines	FEs	Linear	Splines	FEs
since entry:	Lineur	Spines	1 23	Lineu	Spines	1 23
R^2	0.382	0.383	0.387	0.548	0.548	0.550

Notes: Table reports the effects of reduced redeemability on the asinh total trades and asinh barter trades of existing regular users, but uses different controls for weeks since entry. "Linear" refers to linear controls. "Splines" refers to 3-month linear splines. "FEs" refers to fixed effects for each month after entry. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

	(1) Asi	(2) nh items po	(3) sted	(4) Asinh o	(5) offer messag	(6) ges sent
First four weeks	-0.088**	-0.069	-0.147	0.065**	0.105**	-0.024
	(0.027)	(0.045)	(0.092)	(0.029)	(0.049)	(0.086)
After four weeks	-0.165**	-0.189**	-0.303**	-0.126**	-0.058	-0.301**
	(0.038)	(0.062)	(0.122)	(0.039)	(0.069)	(0.114)
Subsample	50-99 trades	100-199 trades	200+ trades	50-99 trades	100-199 trades	200+ trades
Observations	32547	13446	4314	32547	13446	4314
Users	1366	539	167	1366	539	167
R^2	0.325	0.361	0.449	0.478	0.525	0.591
Pre-event mean	0.884	1.128	1.867	1.453	1.955	2.996

Table C6: Effects of reduced redeemability on items posted and offer messages sent among existing regular users, alternative sub-samples for different trade intensity

Notes: Table reports the effects of reduced redeemability on the asinh items posted and asinh offer messages sent of existing regular users, but uses different subsamples of users with different numbers of total trade in the available data, as measured by ratings received. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

D Effects of Redemption Halt

D.1 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 on the Bunz website and app on February 28, 2020.





(a) Redemption share of expenditure

Notes: Figure shows the trends in (a) share of token expenditure used for redemption and (b) token acceptance as measured by the share of items posted with a BTZ price of regular users, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the period before the event, defined as October 10, 2019 to February 27, 2020. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.



Figure D2: Token flows, before and after redemption halt, by user trade intensity

(a) Token issuance, regular users (

(b) Token redemption, balanced sample

Notes: Figure shows the trends in (a) token issuance, (b) redemption, (c) outflow to peers, and (d) inflow from peers, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the period before the event, defined as October 10, 2019 to February 27, 2020. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.

Figure D3: Effects of redemption halt on token acceptance among existing regular users, weekly estimates



Notes: Figure reports coefficients from regressions of token acceptance on week fixed effects, with controls for user fixed effects and months after user entry. The sample includes only existing regular users. Standard errors are clustered at user level. 95% confidence intervals are shown.

	(1)	(2)	(3)
]	Token accepta	nce
Post halt	-0.040**	-0.040**	-0.042**
	(0.009)	(0.009)	(0.009)
Post covid	-0.101**	-0.101**	-0.100**
	(0.012)	(0.012)	(0.012)
Controls for time	Linear	Splines	FEs
since entry:		~P05	1 10
R^2	0.528	0.528	0.531

Table D1: Effects of redemption halt on token acceptance among existing regular users, alternative controls for weeks since entry

Notes: Table reports the effects of reduced redeemability on the token acceptance of existing regular users, but uses different controls for weeks since entry. "Linear" refers to linear controls. "Splines" refers to 3-month linear splines. "FEs" refers to fixed effects for each month after entry. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.

	(1)	(2) Token accepta	(3) nce
Post halt	-0.026**	-0.069**	-0.038
	(0.012)	(0.015)	(0.024)
Post covid	-0.091**	-0.112**	-0.115**
	(0.017)	(0.022)	(0.030)
Subsample	50-99 trades	100-199 trades	200+ trades
Observations	21643	11314	5164
Users	1367	536	169
R^2	0.507	0.533	0.607
Pre-event mean	0.317	0.337	0.342

Table D2: Effects of redemption halt on token acceptance among existing regular users, alternative sub-samples with different trade intensities

Notes: Table reports the effects of reduced redeemability on the token acceptance of existing regular users, but uses different subsamples of users with different numbers of total trade in the available data, as measured by ratings received. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.



Figure D4: Barter and token-mediated trade, before and after redemption halt, by user trade intensity

Notes: Figure shows the trends in (a) token-mediated trades, and (b) barter trades, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the period before the event, defined as October 10, 2019 to February 27, 2020. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.

	(1) Asinh to	(2) oken-mediat	(3) ed trades	(4) Asi	(5) nh barter tra	(6) ades
Post halt	-0.009	-0.008	-0.078**	-0.034**	-0.035**	-0.068*
	(0.006)	(0.012)	(0.029)	(0.008)	(0.016)	(0.037)
Post covid	-0.037**	-0.075**	-0.234**	-0.037**	-0.057**	-0.159**
	(0.009)	(0.016)	(0.039)	(0.014)	(0.024)	(0.063)
Subsample	50-99 trades	100-199 trades	200+ trades	50-99 trades	100-199 trades	200+ trades
Observations	61916	26063	8920	61916	26063	8920
Users	1367	536	169	1367	536	169
R^2	0.147	0.205	0.270	0.187	0.235	0.350
Pre-event mean	0.108	0.176	0.369	0.194	0.305	0.638

Table D3: Effects of redemption halt on trade volumes among existing regular users, alternative sub-samples with different trade intensities

Notes: Table reports the effects of the redemption halt on the asinh token-mediated trades and asinh barter trades of existing regular users, but uses different subsamples of users with different numbers of total trade in the available data, as measured by ratings received. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.





Notes: Figure shows the trends in (a) items posted, and (b) offer messages sent, separately for users grouped by their trade intensity. User trade intensity is measured by total ratings received between 13jan2016 and 19nov2021. All values are normalized based on the average value during the period before the event, defined as October 10, 2019 to February 27, 2020. Users with more than 70% of trades concentrated in one month and were active for less than 6 months are excluded. All lines show the 7-day moving average.

Figure D6: Effects of redemption halt on items posted and offer messages sent among existing regular users, weekly estimates



Notes: Figure shows the event studies of redemption halt on items posted and offer messages sent.

	(1) Asi	(2) nh items po	(3) sted	(4) Asinh ((5) offer messag	(6) ges sent
Post halt	-0.126**	-0.257**	-0.342**	-0.135**	-0.147**	-0.225**
	(0.024)	(0.040)	(0.086)	(0.027)	(0.042)	(0.079)
Post covid	-0.167**	-0.301**	-0.472**	-0.286**	-0.291**	-0.603**
	(0.041)	(0.065)	(0.129)	(0.046)	(0.074)	(0.140)
Subsample	50-99 trades	100-199 trades	200+ trades	50-99 trades	100-199 trades	200+ trades
Observations	61916	26063	8920	61916	26063	8920
Users	1367	536	169	1367	536	169
R^2	0.271	0.297	0.383	0.418	0.464	0.518
Pre-event mean	0.774	1.041	1.680	1.393	1.905	2.829

Table D4: Effects of redemption halt on items posted and offer messages sent among existing regular users, alternative sub-samples with different trade intensities

Notes: Tables test the subsample effects of the redemption halt on frequent users' items posted and offer messages sent. The frequent users are divided according to their total trade volume during the whole sample period. A linear trend of weeks after entry is added. * and ** indicate statistical significance at the 5 and 1 percent level, respectively.



Figure D7: Offers sent vs. trades per offer, before and after redemption halt

Notes: Figure shows the weekly trends in (a) offer messages sent and (b) trades per offer message sent. The dark lines show the 7-day moving average, while the light lines show the daily trend.

Figure D8: Effects of redemption halt on trade volumes among existing regular users, weekly estimates



Notes: Figure reports coefficients from regressions of (a) asinh token-mediated trade and (b) asinh barter trade on week fixed effects, with controls for user fixed effects and months after user entry. The sample includes only existing regular users. Standard errors are clustered at user level. 95% confidence intervals are shown.

E 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.