Buy now, pay later as liquidity insurance: Evidence from an early experiment in China

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ABSTRACT

This study explores the liquidity insurance role of Buy Now, Pay Later (BNPL). As a complementary study to Bian et al. (2023), we provide institutional background and mechanism analysis of BNPL's consumption-boosting effects. Since a significant consumption boosting effect exists even for individuals who did not draw on the BNPL credit line, we argue that BNPL provides liquidity insurance by releasing preexisting precautionary liquidity reserves into consumption. We also explore several robustness checks and heterogeneity analyses.

1. Introduction

Buy Now, Pay Later (BNPL) is a fast-growing new form of consumer credit provided by many FinTech firms around the world, including Affirm in the United States, Klarna in Sweden, Afterpay in Australia, and Ant and Tencent in China. While this online consumer credit used to be unique to the Chinese landscape (Bu, Hanspal, Liao, & Liu, 2022), it is now popular in other regions of the world. And as *The Economist* puts it, "A group of Fintech firms are changing the way consumers borrow."[1] BNPL is often likened to a credit card that evaluates applicants in a fundamentally different, and more inclusive, way from traditional credit cards—namely, by accessing information sources such as payment history, digital footprint, and online social networks (Bu et al., 2022; Grennan & Michaely, 2021). A large proportion of BNPL users (especially in China and such European countries as France and Sweden) did not have credit cards or credit scores—and hence consumer credit—before BNPL, and they are usually younger than 30.

Globally, BNPL is projected to account for $680 billion in transactions by 2025,[2] which raises concerns among economists and regulators about overspending and overindebtedness. While traditional forms of consumer credit such as mortgages, microcredit, and credit cards have been thoroughly explored in previous studies (Abdallah & Lastrapes, 2012; Fuster, Plosser, Schnabl, & Vickery, 2019;

Kaboski & Townsend, 2012; Stango & Zinman, 2016), BNPL has not been, yet its FinTech aspect and inclusive consumer base make it different and warrant thorough investigation. As Bian, Cong and Ji (2023) have provided the first evidence on BNPL's usage patterns, financial inclusion effect, and consumption-boosting effect, this study aims to complement one of their specific findings, namely the effect of BNPL on consumption, by further analyzing the institutional background, mechanism, and heterogeneity of this effect.

While credit card data is gathered and tracked by regulators, there is no publicly available database on BNPL-related consumer spending or debt levels because BNPL operates in a legal gray space without specific requirements for information disclosure. Therefore, we use a unique data set from an early experiment conducted by a representative FinTech company, Ant Group (hereafter "Ant"), which owns Alipay, one of the most popular mobile payment tools in China. In June 2017, before its massive promotion of BNPL, Ant drew millions of mobile-payment users who were eligible for BNPL from its preexisting Alipay customer base, randomly assigned some of the users to a treatment group, and extended BNPL credit to them; it assigned the other eligible users to a control group, which was not offered credit. The unique experiment, combined with monthly consumption information obtained from Alipay users' payment records, allows us to estimate the causal effect of BNPL on consumption.

Although China is not the only setting in which we can investigate this issue, it possesses several notable features. First, in economies in which mobile payment is less popular, BNPL makes mobile payment more attractive and increases adoption,[3] which might also boost expenditure and contaminate an evaluation of BNPL. In contrast, mobile payment boomed in China early—from 2011 to 2015—several years before the arrival of BNPL. In fact, the mobile-payment adoption rate among Chinese adults reached as high as 82% in 2017, and the growth rates in mobile-payment coverage and usage both decreased to nearly zero after that.[4] Thus the Chinese setting enables us to focus on BNPL instead of mobile-payment adoption. Second, this experiment was conducted during the early stages of BNPL, when FinTech companies did not advertise and promote it; thus, ordinary Chinese people did not expect to be granted access to, nor were even aware of it. Third, since the demand for BNPL usually comes from financially underserved consumers, the extensive margin is more important than the intensive margin in capturing the overall effect. More than two-thirds of adults in China do not have a credit history and credit score, making it easier to evaluate the new credit facility's extensive margin there compared with the United States.[5] While existing studies mainly focus on the consumption response of an increase in a preexisting credit limit (Aydin, 2019; Gross & Souleles, 2002), our setting allows us to observe and assess the extensive margin of BNPL for consumers granted credit for the first time.

Based on a subsample of the experiment including 50,000 users from the treatment group and another 50,000 users from the control group, we employ a difference-in-differences approach to examine the effect of BNPL on the monthly total consumption.[6] We first corroborate one of the specific findings in Bian, Cong and Ji (2023) that access to BNPL raised average monthly consumption. Notably, in the treatment group, 86.9% did not actually use the credit extended to them, but the credit line still significantly increased their consumption by RMB 42, or approximately 16.8% of average monthly consumption recorded in Alipay.[7] We propose liquidity insurance as explanation, that access to BNPL acts as insurance for future liquidity needs, so the mere availability of unused credit allows users to release precautionary liquidity reserves to consumption; consumers need not actually tap the credit line, or accumulate debt. We also find that both used and unused credit contribute to higher consumption, confirming the insurance function of unused credit. This finding is different from findings of most previous studies on traditional consumer credit—namely, that credit card users usually do borrow to finance consumer spending, accumulating significant high-interest debt as a result (Bertaut, Haliassos, & Reiter, 2009; Gross & Souleles, 2002; Haliassos & Reiter, 2005; Telyukova, 2013).

We then discuss potential biases, payment-shifting behaviors, and other credit access. We find that, even after accounting for these concerns, the consumption-boosting effect is still significant both statistically and economically.

We move on to investigate several concerns and heterogeneity about the consumption-boosting effect of BNPL. While BNPL is situated in an e-commerce setting, we find that the treated users increase their consumption both online and off-line by economically meaningful magnitudes, which means the effect of BNPL spills over to the overall consumption bundle. Regarding possible excessive consumption due to BNPL, we find that the treated users mainly expand their expenditure on necessities instead of entertainment, which aligns with media reports on, and surveys of, young and low-income BNPL users.[8] Further cross-sectional analyses show that the consumption-boosting effects are more pronounced for men, for younger, tech-savvy people, and for users in second-tier cities whose populations have more preexisting liquidity to spare.

Our findings have important implications. First, regulatory concerns about overspending and systematic risk due to BNPL have arisen worldwide. According to our study, at least during the early stage, the liquidity-insurance mechanism accounts for the bulk of the consumption-boosting effect. Our findings provides complementary evidence to Bian, Cong and Ji (2023), which documents that BNPL can promote credit access without causing overspending and indebtedness. Second, our study suggests that the overspending problem might be attributable to factors beyond BNPL itself, such as intense competition in BNPL industries or large-scale BNPL

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[3] For example, see "How Apple will boost Apple Card with Buy Now Pay Later" on https://www.forbes.com/sites/ronshevlin/2022/06/28/how-apple-will-boost-the-apple-card-with-buy-now-pay-later/?sh=6549301119c4.

[4] See and http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/3602384/index.html; accessed on August 6, 2022.

[5] Retrieved from: http://www.gov.cn/xinwen/2015–10/27/content_2954607.htm; accessed on July 11, 2020.

[6] The full sample is not available for research because of the company's data-protection rules. The subsample was randomly drawn from the full sample by the company's data-safety department.

[7] Average yearly consumption for Chinese people is 18,322 RMB. Retrieved from: http://www.stats.gov.cn/tjsj/zxfb/201801/t20180118_1574931.html; accessed on August 5, 2020.

[8] See https://edition.cnn.com/2022/07/06/economy/buy-now-pay-later-bnpl-inflation-data/index.html; accessed on August 9, 2022.

promotions offering extra benefits. For example, based on a more recent sample of Chinese university students in Wuhan from 2016 to 2019, Bu et al. (2022) suggest that the credit offers are based on students' purchase patterns and find that online borrowing is prevalent among the students. Regulators should scrutinize these factors and issue appropriate regulatory requirements for BNPL industries.

Our paper contributes to several strands of literature. First, First, although there has been a growing focus on FinTech, much of the attention has been directed towards peer-to-peer lending, cryptocurrency, machine learning, and blockchain (Agarwal, Qian, Yeung, & Zou, 2019; Berg, Burg, Gombović, & Puri, 2020; Cumming, Farag, Johan, & McGowan, 2022; Gambacorta, Huang, Qiu, & Wang, 2019; Gao, Lin, & Sias, 2023; Goldstein, Jiang, & Karolyi, 2019; Hasan, He, & Lu, 2022; Tang, 2019; Vallee & Zeng, 2019); little is currently known about BNPL, apart from the work of Bian, Cong and Ji (2023). Second, most existing studies implicitly assume that only utilized credit can boost consumption and document a debt response alongside a spending response (Aydin, 2019; Bacchetta & Gerlach, 1997; Carroll, 1997; Deaton, 1991; Ekici & Dunn, 2010; Friedman, 1957; Gross & Souleles, 2002; Hall & Mishkin, 1982; Hayashi, 1985; Karlan & Zinman, 2010; Ludvigson, 1999; Mishkin, 1976; Zeldes, 1989). In contrast, our findings reveal that even unused credit can stimulate consumption without accompanying debt accumulation. We attribute this effect to a liquidity-insurance mechanism, which has been discussed in the corporate finance literature on credit lines (Acharya, Almeida, Ippolito, & Perez-Orive, 2018; Holmström & Tirole, 1998; Tirole, 2010) but has not been deeply explored in the consumer-finance literature. Finally, our research complements earlier studies on consumer credit (Aydin, 2019; Gross & Souleles, 2002; Ponce, Seira, & Zamarripa, 2017). Because most consumers in our study were granted credit for the first time, we can assess the significance of FinTech-driven financial inclusion. Our findings align with those of D'Acunto, Rauter, Scheuch, and Weber (2020), who examine first-time borrowers from a major European FinTech bank, thus reducing concerns about external validity.

The remainder of this paper is organized as follows. The next section describes the institutional setting, provides details about the experiment, and outlines the strategy for empirical analysis. The third section presents the main results, elucidates the liquidity-insurance function of BNPL, and discusses potential bias. The fourth section explores several concerns related to BNPL. The final section concludes.

2. Overview of the experiment and empirical specification

2.1. Ant group and BNPL

The BNPL experiment was conducted by Ant, the largest FinTech company in China. Ant provides a popular digital payment service, Alipay, which incorporates a variety of financial services such as loans, savings, wealth management, and insurance. In April 2015, Ant launched its BNPL product under the English name Ant Check Later and the Chinese name Huabei, which means "just spend." This product initially served Alipay users by funding purchases on shopping websites operated by Ant's affiliate, Alibaba Group. Later, in 2017, it was extended to accommodate users purchasing from physical retail outlets. As of 2019, more than half of Alipay's users in China had tried the product. Ant Check Later is now utilized by hundreds of millions of Chinese citizens for day-to-day purchases, including groceries, restaurant meals, clothing, and cell phones from both physical and online stores. A large proportion of users do not possess traditional, bank-issued credit cards, and most users do not even qualify for them.

Ant Check Later allows Alipay users to pay for items with a credit line ranging from RMB 500 to RMB 50,000, with an interest-free payment period and installments. Credit can be advanced for specific purchases as long as the purchase amount does not exceed the credit line, meaning that customers' purchases are first made with credit and subsequently debited from their Alipay accounts. If borrowers do not repay their balance within the interest-free period, they accumulate interest-bearing revolving debt equivalent to the unpaid amount.

2.2. The experiment

To better understand consumer credit usage, Ant's consumer credit department conducted a trial on millions of users who already met Ant's credit eligibility criteria but had not yet been offered consumer credit. Eligibility was primarily determined by users' payment and consumption histories, which reflected their ability to repay the consumer credit. On June 1, 2017, the company randomly assigned some Alipay users to the treatment group; these individuals were offered BNPL and were notified of their new credit limits immediately. Users in the control group were not offered BNPL and were unable to request credit. The experiment concluded after two months, in August 2017, at which point the control group was also granted credit.

This experiment was designed to assure the randomization in a few ways. First, the experiment selected users for BNPL based on a fully automated randomized algorithm. After being selected, users in the treatment group did not need to undergo any procedures to activate or turn down the BNPL offer. Thus, while the treatment group could ignore the offer and decide not to use it at the start, they still enjoyed access to this credit offer and could choose to use it at any time during the experiment. The credit limits for the treatment group stayed unchanged during the experiment. Second, Ant offered no rewards such as coupons, points, or credits for using BNPL during the experiment. Third, the sample comprised users only from second- and lower-tier cities, where users had little chance of learning about BNPL from neighbors or colleagues. Treated users became aware of BNPL only after they received the notification on June 1. The control group could not ask for the credit line and did not expect to receive BNPL after the experiment. Fourth, Ant did not notify its customers that they were part of an experiment, which eliminated the possibility that the treatment group might change their behavior in response to their knowledge of being participants in the experiment. In sum, this experiment offers a unique opportunity to study the effects of a truly exogenous credit supply shock in the form of unexpected credit access.

2.3. Sample and data

Our data set is a subsample of users in the experiment, including 700,000 user-month observations for 100,000 users between January and July 2017. Due to Ant's privacy-protection rules, the full sample is not available to researchers. The company's data-security department randomly drew 50,000 users from the original treatment group and matched 50,000 users from the original control group based on their consumption and payment histories.

Table I shows summary statistics for the main variables in our analysis. Panels A and B describe the treatment and control groups, respectively. Besides consumption records in Alipay, we have several control variables at our disposal: a proxy for a user's financial position in the form of monthly cash flow in their Alipay account; the user's Alipay account age; the number of bank cards tied to the Alipay account; the user's age and gender; and a dummy variable indicating if the user has a credit card tied to their Alipay account. Furthermore, we obtain information on (1) the size of the BNPL credit line, (2) use of BNPL credit, and (3) how much of the borrowed amount is repaid before the end of the interest-free period.[9]

One-sided *t*-tests on consumption (including online and offline consumption) show that these variables are not statistically higher in the pretreatment period for the treatment group compared to the control group. Although we find no statistically significant differences in the levels of pre-trend variables regarding consumption, and users' characteristics such as age and gender, we still adopt a difference-in-differences method as the main strategy as the sample here is only a subsample of the randomized experiment.

As reported in Table I, monthly Alipay consumption in our sample before treatment was RMB 250, or 16.3% of consumption in 2017 as reported by the National Bureau of Statistics (NBS) of China. While consumption paid for with Alipay is only part of a consumer's aggregate consumption, we have reasons to believe this portion is representative. First, digital payments through third-party payment tools have become an important option for ordinary Chinese people for day-to-day spending, including both online purchases and in-store payments in almost all large shopping malls, supermarkets, retail stores, and even market stalls. According to a market survey conducted by Ipsos, a leading global market research company, 58% of Chinese people's day-to-day expenses are paid for using third-party payment tools. Second, among third-party payment tools, Alipay is one of the most popular. The number of Alipay users is over 900 million, accounting for >90% of Chinese people aged 15–65.

2.4. Model specification

Our data set covers the pretreatment and post-treatment periods from January to July 2017, which allows us to compare the outcomes of the treated users after gaining access to BNPL relative to the time before they had credit access and relative to users in the control group. The estimation model is specified as follows:

$$Consumption_{it} = \alpha + \beta_1 post_t + \beta_2 treat_i * post_t + \gamma X_{it} + v_i + \varepsilon_{it} \tag{1}$$

Here, $Consumption_{it}$ represents the amount of consumption spending that is recorded by Alipay for consumer i in month t; $treat_i$ is a dummy variable that equals 1 for users in the treatment group and 0 for those in the control group; $post_t$ is an indicator variable that equals 1 for user-month observations in June and July during the two-month experiment and 0 otherwise. X_{it} is a set of control variables including users' gender and age and a proxy variable for their financial position. ε_{it} is the error term.[10] Because of Ant's privacy-protection requirements, we are not authorized to merge the Alipay user data with other survey data and thus lack commonly used variables regarding users' characteristics, such as income, marital status, family size, and occupation. Thus we included user fixed effect v_i to control for user-specific factors. We expect a significant and positive β_2, which would indicate a positive spending response to the extensive margin of credit—that is, access to BNPL.

3. Main results

3.1. Baseline results

We begin by focusing on the overall level of the consumption response to the extensive margin of credit—that is, the availability of a new credit line. Table II shows the results for the estimated impact of BNPL on consumption spending. We include Columns (1) and (2) to corroborate the basic consumption boosting effect documented in Bian, Cong and Ji (2023) and make comparisons with the effect on zero-use users in Columns (3) and (4), which we will delve into later to demonstrate the liquidity insurance role of BNPL. In Column (1), we simply exploit standard DID to compare the expenditures of customers in the treatment group with those of customers in the control group. Column (2) shows the results with user fixed effects included. Furthermore, since >80% of treated users have not utilized the BNPL credit at all, Column (3) focuses on these zero-use users. They are free of the curiosity effect, which occurs when users only try out BNPL due to curiosity and mechanically increase their consumption. Building on Column (3), Column (4) further drops the June sample to alleviate the potential influence of the June shopping festival.

In all settings, the interaction term between the treatment and the time indicator, $treat_i * post_t$, is significant and positive, which implies that BNPL facilitates consumption. In Column (1), compared with the average monthly consumption of untreated users,

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[9] Summary statistics for these variables are not shown here because of confidentiality issues and regulations.

[10] We used raw standard errors in the reported results and have also tried errors clustered at the individual level for the baseline regression. We are pleased to share that the conclusions remain unchanged.

Table I
Summary statistics.

Before (January–May)					After (June–July)			
Vars.	No. obs.	Mean	Std. dev.	Median	No. obs.	Mean	Std. dev.	Median
A. Treatment group								
Consumption	250,000	0.25	0.21	0.19	100,000	0.39	0.99	0.21
Online consumption	250,000	0.18	0.19	0.10	100,000	0.22	0.47	0.10
Off-line consumption	250,000	0.07	0.11	0.01	100,000	0.18	0.87	0.02
Financial position	250,000	1.16	2.00	0.3	100,000	2.13	5.18	0.40
Alipay account age	250,000	1.65	1.12	1.38	100,000	1.65	1.12	1.38
No. of bankcards	250,000	1.35	0.66	1	100,000	1.35	0.66	1
Credit card[d]	250,000	0.01	0.10	0	100,000	0.01	0.10	0
Age	250,000	31.75	8.68	30	100,000	31.75	8.68	30
Male[d]	250,000	0.41	0.49	0	100,000	0.41	0.49	0
B. Control group	No. obs.	Mean	Std. dev.	Median	No. obs.	Mean	Std. dev.	Median
Consumption	250,000	0.25	0.21	0.20	100,000	0.30	0.56	0.19
Online consumption	250,000	0.18	0.20	0.11	100,000	0.18	0.34	0.09
Off-line consumption	250,000	0.07	0.11	0.01	100,000	0.12	0.45	0.00
Financial position	250,000	1.19	2.25	0.15	100,000	1.66	3.45	0.10
Alipay account age	250,000	1.48	0.93	1.29	100,000	1.48	0.93	1.29
No. of bank cards	250,000	1.24	0.56	1	100,000	1.24	0.56	1
Credit card[d]	250,000	0.01	0.07	0	100,000	0.01	0.07	0
Age	250,000	31.81	8.37	30	100,000	31.81	8.37	30
Male[d]	250,000	0.41	0.49	0	100,000	0.41	0.49	0

Note: Consumption, Online consumption, In-store consumption, and *Financial position* are in thousand RMB. *Financial position* is proxied by monthly cash flow in the Alipay account. *Alipay account age* is the number of years from the date the user opened an Alipay account to June 2017. *No. of bank cards* is the number of bank cards tied to the user's Alipay account, including both debit and credit cards. In rows 9 and 10 of both panels, superscript *d* indicates a dummy variable with a value of one indicating the user owns at least one credit card and is male.

Table II
Baseline results: FinTech consumer credit and consumption.

	Dependent variable:aggregate consumption (monthly, thousand RMB)			
	(1) Basic DID	(2) With fixed effects	(3) Zero-use users	(4) Excluding June
Treat	−0.001			
	(0.001)			
Post	0.049***	0.030***	0.033***	0.048***
	(0.002)	(0.002)	(0.001)	(0.002)
Treat×Post	0.092***	0.073***	0.042***	0.031***
	(0.002)	(0.002)	(0.002)	(0.002)
Financial position		0.039***	0.034***	0.032***
		(0.0003)	(0.0003)	(0.0003)
Age				
Male				
Constant	★***			
	(0.001)			
User fixed effects	NO	YES	YES	YES
Observations	700,000	700,000	645,995	553,710
R^2	0.011	0.245	0.235	0.248

Note: Constant is not reported because of privacy-protection requirements. *Financial position* is proxied by monthly cash flow in the user's Alipay account. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

consumption of the treated group increases by RMB 92, or approximately 36.8% of pretreatment monthly consumption paid for with Alipay (0.092/0.25) or 6.03% of total average monthly consumption (0.092/1.53) as reported by NBS.[11] With user fixed effects, the coefficient's magnitude varies slightly to RMB 73, accounting for 29.2% of pretreatment monthly consumption paid for with Alipay or 4.78% of average total monthly consumption documented by NBS. Importantly, Columns (3) and (4) demonstrate a significant consumption-boosting effect for treated users who did not actually use the BNPL credit, accounting for 86.9% of the treatment group.

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[11] Average yearly consumption by Chinese people is RMB 18,322. Retrieved from: http://www.stats.gov.cn/tjsj/zxfb/201801/t20180118_1574931.html; accessed on August 5, 2020.

Even for zero-use treated users, the consumption-boosting effects are all statistically significant at the 1% level and economically meaningful, with magnitudes ranging from RMB 31 to 42.

Regarding the control variables, the coefficients of age and proxied financial position show a significant and positive relationship with consumption spending, and the average monthly consumption of men is significantly lower than that of women. The insignificant coefficient of $treat_i$ provides evidence that there is no significant difference in consumption between the treatment and control groups in the pretreatment period. The positive coefficient on $post_t$ is in line with the increasing trend of consumption in China.

3.2. The liquidity-insurance role of BNPL

In this section, we propose that BNPL's function as liquidity insurance enables it to boost consumption for zero-use users, who constitute >80% of treated users. Given the short two-month duration of the experiment, it is understandable that the proportion of zero-use users is relatively high. Before Ant extended credit to treated users, they saved their preexisting liquidity prudently, ensuring they had spare liquidity available in case of an emergency. After being extended BNPL, their access to credit provided insurance for future liquidity needs, releasing their preexisting precautionary liquidity for consumption. The mere existence of access to BNPL was sufficient to generate a positive consumption response; users did not need to actually tap into the new credit line.

(1) The effect of unused credit

To further test the liquidity-insurance role of BNPL, we now focus on the effect of unused credit. Instead of relying on the actual usage of credit to increase consumption, the liquidity-insurance role of BNPL only depends on the existence of credit access, which means even the unused part of credit boosts consumption. Therefore, after controlling for the used credit, a positive correlation between consumption and the unused credit amount would support the liquidity-insurance hypothesis.

To test for the effect of unused credit, we disaggregate the total credit line into the following parts: unused available credit (the amount of remaining credit that can be used in the future), interest-free spending (the used amount to be repaid before the end of the grace period), and interest-bearing spending (the used amount carried from the previous billing cycle that incurs interest). The estimation model is specified as follows:

$$Consumption_{it} = \beta_0 + \beta_1 unused\_credit_{it} + \beta_2 interestfree\_spending_{it} + \beta_2 interestbearing\_spending_{it} + \gamma X_{it} + v_i + \varepsilon_{it} \qquad (2)$$

Here, we maintain the same set of control variables as in Eq. (1). We expect positive coefficients for all three parts of the credit lines, which would indicate a consumption-boosting effect of the unused credit even after controlling for the used part.

Table III shows the regression results. Column (1) directly estimates Eq. (2), and Column (2) replaces the unused credit with the total amounts of the granted credit line. The credit-related variables take the value of zero for all observations (both treatment and control groups) in the pretreatment period and for control-group observations in the post-treatment period.

In Table III, the coefficient magnitude of 0.027 on unused available credit in Column (1) implies that each extra thousand RMB of available credit is associated with an average increase of RMB 27 in consumption. In Column (2), the coefficient for the credit line is the same as the coefficient for unused credit in Column (1), which is intuitive since the effect of the remaining credit line after controlling for its used part comes exactly from the unused available credit. These findings are consistent with the idea that the untapped credit could also boost consumption, supporting BNPL's insurance role.

The coefficient on interest-bearing spending is smaller than that on interest-free spending but still quite significant, indicating liquidity obtained by rolling over the actual balances relieves current pressure and raises consumption but also incurs some interest burden. This finding lines up with studies on household debt, which find interest burdens lead to a precautionary reduction of current consumption (Dynan & Edelberg, 2013; Ekici & Dunn, 2010).

Note that BNPL's consumption boosting effect and liquidity insurance role should be interpreted with caution. First, although BNPL shows insurance property, it cannot replace real precautionary savings in the sense to repay other debt. Second, only zero-use BNPL users are free of "repayment pressure", the nonzero-use BNPL users will face repayment pressure once they use the credit. The liquidity insurance provided by BNPL is not perfect substitutes to savings and may not have long-term effects. Last but not least, beside rational explanation as liquidity insurance, one may argue there might exist some other mechanisms lead to consumption boosting effect such as "money illusion" (Campbell & Vuolteenaho, 2004; Cohen, Polk, & Vuolteenaho, 2005). However, while "money illusion" is irrational with no insurance actually provided for future liquidity needs, BNPL indeed provides insurance to liquidity shocks.

(2) Liquidity insurance in related literature

The liquidity-insurance role of credit access is widely discussed in the corporate-finance literature regarding the function of credit lines firms obtain from banks (Acharya et al., 2018; Holmström & Tirole, 1998; Tirole, 2010); however, it has not been deeply explored in the consumer-credit literature. While most existing studies on traditional consumer credit implicitly assume that consumption increases only after the credit is used, the liquidity-insurance role of BNPL means that consumption increases without debt accumulation.

Though traditional consumer credit could also play a role as insurance instrument for potential liquidity risk in theory (Cochrane, 1991; Deaton, 1991), the liquidity-insurance role is more pronounced in BNPL than bank credit cards. One fundamental difference between FinTech companies and traditional financial institutions is that FinTech companies enjoy the information advantage of having

Table III

The consumption-boosting effect of unused credit.

	Dependent variable: aggregate consumption (monthly, thousand RMB)	
	(1)	(2)
Credit line		0.027***
		(0.002)
Unused (available) credit	0.027***	
	(0.002)	
Interest-free spending	1.119***	1.092***
	(0.015)	(0.015)
Interest-bearing spending	0.757***	0.732***
	(0.035)	(0.035)
Financial position	0.038***	0.038***
	(0.0003)	(0.0003)
Post	0.045***	0.045***
	(0.001)	(0.001)
User fixed effects	YES	YES
Observations	700,000	700,000
R^2	0.251	0.251

*Note: Financial position is proxied by monthly cash flow in the user's Alipay account. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.*

users' digital footprints, which helps them to become more financially inclusive. While FinTech companies can provide credit access to many first-time borrowers (the extensive margin), traditional financial institutions mainly vary the intensive margin of credit for their customers, who already enjoy credit access. As D'Acunto et al. (2020, p. 3) put it, "The insurance role of obtaining a credit facility for the first time does not apply to borrowers who already had access to credit." Hence the effect we document could not arise in settings of traditional consumer credit. It is, however, consistent with D'Acunto et al.'s (2020) findings regarding first-time borrowers from a major European FinTech bank. As FinTech greatly increases financial access and promotes financial inclusion, the extensive margin of BNPL found in both our study and D'Acunto et al. (2020) becomes more important in evaluating the actual impact of FinTech credit.

To some extent, the liquidity-insurance role of BNPL is also consistent with the classic liquidity-constraint mechanism that the extensive consumption literature has documented.[12] Suppose consumers do not face binding liquidity constraints currently but expect with a positive probability that they will in the future. In that case, they may want to use zero or little credit now and preserve the credit as a buffer stock. In fact, existing literature has documented that the marginal propensity to consume out of increases in credit limits is positive for people well below the limit (Gross & Souleles, 2002). However, our results suggest that such studies might underestimate the true consumption effect by measuring consumption only as credit card consumption. For instance, in Gross and Souleles (2002), the marginal propensity to consume (MPC), defined by the authors as the change in credit card debt over the change in credit limits, equals zero for zero-use users by construction.

3.3. Discussion of potential concerns

Because of limitations in the data set and the experiment design, we have three reasons to be cautious when interpreting the results. First, we consider the potential concern that the sample in our study is only a subsample of the original one. Second, the consumption measurement is confined to payments recorded by Alipay; therefore, users' shifting of payments to Alipay is recorded as a positive consumption response even though it does not actually increase total consumption. Third, access to credit cards may deteriorate the insurance function of BNPL, as credit cards already function as a type of liquidity insurance. To identify the direction and magnitude of the potential concerns, and to provide reasonable intervals for our estimation, we explore the above concerns in detail.

(1) Possible concern on the subsample

To assess the concern due to the subsample setting instead of the full sample, we only need to consider whether temporary individual-specific factors differ between the treatment and control groups during the experiment. Since the individual-specific factors and common macroeconomic factors both vanish in a difference-in-differences approach's sequential differences, the estimation is unbiased as long as the selection into treatment is independent from temporary individual-specific effects (Caliendo & Hujer, 2005).

One important factor that is closely related to the consumption response, differs between the two groups, and changes after the experiment begins is credit demand. While this paper aims to estimate the consumption response to an exogenous credit supply shock while assuming credit demand stays the same, in fact the temporarily interest-free character of the credit is likely to increase treated users' credit demand and thus their consumption. If so, the consumption response is likely to be overestimated.

To provide some bounds on the biasedness generated in the estimates, we divide the treatment group into subsamples by measurements of both credit supply and ex post credit demand. Our intuition is that the treated users whose effects are most unlikely to be overestimated are those with the smallest BNPL credit lines (thus smallest amount of interest-free credit) and least use of the credit

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[12] We thank the anonymous reviewer for this valuable suggestion.

lines because their ex post credit demands stay the same as before the experiment. In contrast, the consumption response of users with a larger credit line and a larger portion of available credit is most likely to be overestimated because these users enjoy the most interest-free credit and subsequently increase their ex post credit demand the most during the experiment.

In Table IV, we first split the treatment group into two groups (with larger and smaller lines of credit); then we split each group into three subgroups of higher, lower, and no credit use, according to the subgroups' median amounts of credit drawn. We thus have six subsamples for analysis. The impact of BNPL on consumption is estimated for each treated subsample by comparing the subsample with the entire control group. The results in Column (3) show the consumption response by the users with the highest level of credit supply and the highest level of demand (that is, the users whose consumption response is most likely to be overestimated), while the results in Column (4) show the impact for consumers with the lowest credit supply and zero ex post credit demand (that is, those whose response is least likely to be overestimated). In all regressions, we are mainly interested in the coefficients of the interaction term $treat_i * post_t$. Comparing the results across the subgroups with a larger line of credit (Columns [1]–[3]), we find that for users with similar credit supply, the magnitude of the coefficients increases with demand for credit. For these consumers, monthly consumption increases by RMB 84, RMB 144, and RMB 470 for the users with zero, lower, and higher credit use, respectively, compared to the control group. The story is the same for the consumers with a smaller line of credit (Columns [4]–[6]): average monthly consumption increases by RMB 30, RMB 110, and RMB 349 for users with zero, lower, and higher credit use. The results are in line with our conjectures above: the overestimation problem is more severe for users with higher ex post credit demand. As seen in Columns (3) and (6), the consumption response amounts to nearly five to six times the baseline estimation in Table II.

However, the results also show that the overestimation in the baseline regressions is not severe. Even for users with zero ex post credit demand—and thus no temporary individual-specific demand effect—the estimated consumption response still amounts to RMB 30 to RMB 47 (as seen in Columns [1] and [4]), which is in line with Columns (3) and (4) in the baseline results for zero-use users.

(2) Payment-shifting behavior

Regarding overestimation due to payment-shifting behavior, our setting suffers from the payment-shifting problem less than other settings. One reason is that, as mentioned in the introduction, mobile payment was already widely accepted in 2015 and the growth rates in its coverage and usage depth had both decreased to nearly zero by 2017. So payment is unlikely to have shifted to mobile from nonmobile payment methods. Another reason is that in this experiment, in which eligibility of credit were determined by Alipay users' payment histories, consuming via Alipay is more representative for the overall consumption for users in the experiment than average users and using Alipay to pay is a well-established habit for them rather than a behavior newly induced by extended credit.

However, we cannot fully rule out the possibility of payment shifting. We address the issue by focusing on treated users who do not use BNPL and thus are least motivated to shift to Alipay to enjoy the convenience of credit.

In Table IV, a large proportion of treated users—>80%—do not use their credit lines at all. However, even for these zero-use users, the coefficients of the interaction term are still significant both statistically and economically. In other words, a large portion of treated users choose not to use the extended credit but still increase their consumption after gaining access to credit. Thus, our estimation is at least not fully driven by payment-shifting behavior.

We determine that the lower bound for the estimated consumption response is RMB 30–47, which accounts for 12%–18.8% of pretreatment monthly consumption as documented by Alipay and 1.96%–3.07% of monthly consumption as reported by NBS. We caution that the lower bound is likely to underestimate the consumption response since the estimation is based on the subsample that is least credit constrained and that has zero ex post credit demand.

(3) Alleviating the Influence of Traditional Credit Cards.

As BNPL and traditional credit cards are similar in providing credit and liquidity, it is possible that BNPL's consumption boosting effect for credit card holders are driven by the increase of total credit line, instead of liquidity insurance. And the credit card holders might choose to use traditional credit and left BNPL unused simply because their stickiness to the old payment habit. To focus on the insurance role of BNPL and alleviate the influence of existing credit lines, we narrow our analysis to a subsample of users without credit cards and repeat the baseline regressions.

Table V shows the consumption response to BNPL of all users without linked credit card in our data set. Specifically, the sample includes users in both the treatment and control groups who do not have linked credit cards. In Column (1), the average monthly consumption increases by RMB 72 after being extended BNPL, suggesting that the consumption boosting effect of BNPL is still significant after alleviating the influence of bank credit. We further split this subsample depending on whether the treated users have utilized their BNPL credit. In Column (2), for those who utilized the BNPL credit, the consumption increased by RMB 254; in Column (3), for those who have not utilized the credit after extend BNPL, their consumption also increases significantly, by a smaller magnitude at 41 RMB.

To sum up, the analyses of zero-use users help alleviate concerns regarding the subsample setting and payment-shifting behavior, and the analyses of users without linked credit cards help us alleviate the influence of extra credit access. We can relatively safely conclude that access to BNPL causes treated users' consumption to increase compared to the control group, and the effect is both economically and statistically significant.

Table IV
Subsamples divided by credit supply and demand.

Subsamples	Dependent variable: aggregate consumption (monthly, thousand RMB)					
	Larger credit line and zero use (1)	Larger credit line and lower used amount (2)	Larger credit line and higher used amount (3)	Smaller credit line and zero use (4)	Smaller credit line and lower used amount (5)	Smaller credit line and higher used amount (6)
Post	0.029***	0.038***	0.034***	0.038***	0.038***	0.038***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Treat×Post	0.084***	0.144***	0.470***	0.030***	0.110***	0.349***
	(0.004)	(0.006)	(0.007)	(0.002)	(0.009)	(0.009)
Financial position	0.041***	0.023***	0.030***	0.023***	0.023***	0.023***
	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0004)
User fixed effects	YES	YES	YES	YES	YES	YES
Observations	429,653	365,561	365,561	574,623	357,301	357,301
R^2	0.238	0.250	0.274	0.240	0.249	0.250
Adjusted R^2	0.111	0.125	0.153	0.113	0.124	0.125

Note: The treatment group is split at the median credit line into two groups: larger (above median level) and smaller (below median level) credit line. Then, each group is further split into three groups—higher (above median level), lower (below median level), and zero use—according to the median value of their credit balance. *Financial position* is proxied by monthly cash flow in the user's Alipay account. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table V
Analyses on users without credit cards.

	Dependent variable: aggregate consumption (monthly, thousand RMB)		
	(1)	(2)	(3)
	Without credit cards	Nonzero-use users	Zero-use users
Post	0.030***	0.031***	0.033***
	(0.002)	(0.001)	(0.001)
Treat×Post	0.072***	0.254***	0.041***
	(0.002)	(0.004)	(0.002)
Financial position	0.039***	0.038***	0.033***
	(0.0003)	(0.0003)	(0.0003)
User fixed effects	YES	YES	YES
Observations	695,149	401,695	641,914
R^2	0.245	0.27	0.235

Note: The sample includes all users who do not have linked credit cards. Consumption is on a monthly basis and in thousand RMB. *Financial position* is proxied by monthly cash flow in the user's Alipay account. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

4. Further analyses

In this section, we address several concerns and conduct some heterogeneity analyses regarding BNPL. We first decompose consumption into off-line and online consumption and show that the effect of BNPL is not limited to online consumption. Then we distinguish different commodity categories and find the consumption-boosting effect is mainly for necessities, which is consistent with the low-income and young user base of BNPL. We also examine heterogeneity in consumers' age and city of residence.

4.1. Online and off-line consumption

In the past few years, China's e-commerce has grown tremendously, and BNPL originates from e-commerce platforms. Is the consumption-boosting effect driven by the growth in e-commerce? With this question in mind, we compare the impact of BNPL on online and off-line consumption. If both types of consumption have increased, our evidence showing the positive impact of BNPL on overall consumption is more convincing.

Table VI shows the results for the impact of BNPL on both online and off-line consumption. Coefficients of the interaction term $treat_i \ast post_t$ show a positive and significant impact of credit on both online and off-line consumption, and the magnitude of the increase in off-line consumption is even greater. Average monthly online and off-line consumption is RMB 32 and RMB 41 more among users in the treatment group than users in the control group, respectively. Such results could be attributable to the wide acceptance of mobile payment and BNPL for in-store consumption in China. The results indicate that the consumption-boosting effect of BNPL is not solely driven by the rapid development of e-commerce, but rather represents an increase in both online and off-line consumption.

Table VI
Impact of FinTech consumer credit on various types of consumption.

	Dependent variables: disaggregated consumption (monthly, thousand RMB)	
	Off-line consumption (1)	Online consumption (2)
Post	0.028***	0.002***
	(0.001)	(0.001)
Treat×Post	0.041***	0.032***
	(0.001)	(0.001)
Financial position	0.035***	0.004***
	(0.0002)	(0.0002)
User fixed effects	YES	YES
Observations	700,000	700,000
R^2	0.250	0.313
Adjusted R^2	0.125	0.198

Note: Financial position is proxied by monthly cash flow in the user's Alipay account. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

4.2. Consumption in different commodity categories

BNPL provided by FinTech companies might serve as a gateway to credit for individuals who would fail to obtain credit from a traditional bank (for example, Bartlett, Morse, Stanton, & Wallace, 2022; Claessens, Frost, Turner, & Zhu, 2018; Dobbie, Liberman, Paravisini, & Pathania, 2018). However, populations that have never had access to credit generally have low financial literacy, giving rise to a concern whether they can manage their finances well. Does access to BNPL lead to severe misuse of credit and to excessive consumption? Put differently, is the consumption increase driven by luxuries or entertainment? To answer these questions, we examine the impact of consumption spending on different commodity categories and discuss the related concern of excessive spending.

Because we lacked data regarding the specific categories of spending on platforms not owned by Alibaba, we could only analyze online spending conducted on Alibaba's e-commerce platforms. Given that Alibaba has over half of the e-commerce market share in China,[13] any concern about the representativeness of our analysis is greatly eased. Alibaba's e-commerce platform classifies consumption into three types: consumption for necessities, consumption for development, and consumption for entertainment. For example, a bag of rice would be classified as a necessity, a math book would be classified as development, and movie tickets would be classified as entertainment. The remaining, unclassified consumption is categorized as "other."

Table VII shows the estimated impact of BNPL on the different commodity categories of Alibaba's online consumption. Following access to BNPL, the increase in consumption for necessities, development, and entertainment is estimated to be RMB 14, RMB 4, and RMB 9, respectively. Consumption for necessities thus responds the most. The increases for entertainment and development are not economically significant. Since access to BNPL mainly raises spending on necessities, the concern regarding excessive spending and credit misuse could be mitigated.

This finding is in line with the fact that our sampled users come from second- and lower-tier cities, so they do not spend much on development or entertainment in day-to-day life. A young adult in a small town may have never traveled nor purchased a luxury good. When they gain access to BNPL, they choose to increase their expenditure on necessities. Our findings are also backed up by media reports in the United States. As CNN puts it, BNPL users are "buying cleaning supplies, they're buying socks, they're buying sneakers, they're buying everyday household items."[14] As in China, BNPL users in the US are young and financially underserved, so they first increase spending on necessities rather than entertainment once given credit access. Overall, no significant evidence suggests that improved access to BNPL leads to excessive consumption.

Not that our findings are different from Bu et al. (2022), who also focus on BNPL in China but find that online borrowing is prevalent among students and most students borrow for entertainment-related consumption. Note that the sample in Bu et al. (2022) are university students in Wuhan, China. As universities in China are mainly publicly owned, which come with low tuition fees and low-priced meals in university restaurants, students' spending on necessities and developments are quite limited. Their finding that most students borrow for entertainment does not contradict our study since our sample is not confined to university students.

4.3. Consumption by consumers from different city tiers

Table VIII shows the estimated results for consumption by consumers in different cities, and here we detect substantial heterogeneity.[15] The tier system of Chinese cities is frequently referred to by media publications and in economic analyses. Cities are classified in four tiers: first tier, second tier, third tier, and fourth tier and below. First-tier cities represent the most developed areas of the country. They are large, densely populated metropolises with huge economic, cultural, and political influence. Fourth- and lower-

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[13] According to an e-commerce survey conducted by iMedia Research. Retrieved from https://www.iimedia.cn/c400/61300.html; accessed on August 5, 2020.
[14] See https://edition.cnn.com/2022/07/06/economy/buy-now-pay-later-bnpl-inflation-data/index.html; accessed on August 9, 2022.
[15] Retrieved from https://en.wikipedia.org/wiki/Chinese_city_tier_system#cite_note-SouthPost-11; accessed on December 23, 2020.

Table VII
BNPL's impacts on various commodity categories.

	Dependent variables: disaggregated online consumption (monthly, thousand RMB)			
	Necessities	Development	Entertainment	Other
	(1)	(2)	(3)	(4)
Post	−0.010***	0.003***	0.007***	0.002***
	(0.001)	(0.0003)	(0.0004)	(0.0003)
Treat×Post	0.014***	0.004***	0.009***	0.004***
	(0.001)	(0.0005)	(0.001)	(0.0004)
Financial position	0.001***	0.001***	0.001***	0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
User fixed effects	YES	YES	YES	YES
Observations	700,000	700,000	700,000	700,000
R^2	0.328	0.218	0.217	0.237
Adjusted R^2	0.216	0.087	0.086	0.110

Note: The four categories of consumption—necessities, development, entertainment, and other—are based on Alibaba's criteria for its e-commerce platforms. *Financial position* is proxied by monthly cash flow in the user's Alipay account. ***p < 0.01; **p < 0.05; *p < 0.1.

Table VIII
Consumption for consumers from different city tiers.

	Dependent variable: aggregate consumption (monthly, thousand RMB)		
Subsamples	Second-tier cities	Third-tier cities	Fourth- and lower-tier cities and towns (3)
	(1)	(2)	
Post	0.043***	0.025***	0.025***
	(0.003)	(0.003)	(0.002)
Treat×Post	0.096***	0.061***	0.065***
	(0.004)	(0.004)	(0.003)
Financial position	0.035***	0.059***	0.026***
	(0.0005)	(0.001)	(0.0004)
User fixed effects	YES	YES	YES
Observations	197,918	230,531	270,172
R^2	0.250	0.259	0.234
Adjusted R^2	0.125	0.135	0.106

Note: Financial position is proxied by monthly cash flow in the user's Alipay account. ***p < 0.01; **p < 0.05; *p < 0.1.

tier cities are mainly developing cities and small towns.[16] Average monthly consumption increases by RMB 96, RMB 61, and RMB 65 among users in the treatment group from second-tier, third-tier, and fourth- and lower-tier cities, respectively, compared with consumers in the control group.

The consumption-boosting effect is most pronounced for users in second-tier cities, who have more disposable income in our sample; it is least pronounced for users in fourth- and lower-tier cities or towns, who are more likely to have binding constraints and less likely to have preexisting liquidity. This pattern is consistent with the liquidity-insurance role of BNPL, in which consumption responds more among people with more preexisting liquidity. The heterogeneity across city tiers also lines up with the finding of D'Acunto et al. (2020) that the spending reaction is greater for users with more liquid assets.

4.4. Consumption differences by consumer demographics

We now estimate the impact for groups of different genders and ages in the subsamples; Table IX shows the results. The regression results in Columns (1)–(3) suggest that men have a stronger propensity to consume out of BNPL than women. However, recall that the baseline results in Table II show lower absolute consumption among men; thus, the greater marginal propensity to consume is consistent with diminishing marginal utility. Table IX also shows that the increase in consumption tends to be the largest for users younger than 35 years old. This finding is consistent with the fact that young consumers are more tech-savvy and more open to new borrowing facilities.

5. Conclusions

In this paper, we provided complementary evidence on the consumption-boosting effect of BNPL documented in Bian, Cong and Ji

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[16] A widely used but unofficial list published by the *South China Morning Post* ranks 613 Chinese cities in four tiers, with the first-tier cities being Beijing, Shanghai, Guangzhou, Tianjin, and Chongqing. We mainly refer to this list in our analysis. https://multimedia.scmp.com/2016/cities/ China's tiered city system explained; accessed on December 23, 2020.

Table IX
Consumption differences by consumer demographics.

Subsamples	Dependent variable: aggregate consumption (monthly, thousand RMB)					
	Full sample (1)	Male (2)	Female (3)	Age: 20–34 (4)	Age: 35–44 (5)	Age: > 45 (6)
Post	0.015***	0.052***	0.015***	0.024***	0.037***	0.056***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.005)
Treat×Post	0.062***	0.089***	0.062***	0.080***	0.056***	0.060***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.007)
Male×Post	0.036***					
	(0.003)					
Male×Treat×Post	0.026***					
	(0.005)					
Financial position	0.039***	0.038***	0.040***	0.039***	0.046***	0.023***
	(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.001)	(0.001)
User fixed effects	YES	YES	YES	YES	YES	YES
Observations	700,000	284,298	415,702	458,185	177,464	64,351
R^2	0.245	0.248	0.243	0.255	0.231	0.234
Adjusted R^2	0.120	0.123	0.117	0.130	0.103	0.107

Note: Financial position is proxied by monthly cash flow in the user's Alipay account. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

(2023). BNPL has become popular among young underbanked consumers as a virtual credit product to pay for their everyday purchases. We used a unique data set from a randomized experiment conducted by a representative Chinese FinTech company and explore the liquidity insurance role of BNPL. As >80% of the treated users did not draw on the new credit but still increased their consumption, we argued that the mere existence of credit access, even if unused by consumers, provides insurance for future liquidity needs and releases preexisting precautionary liquidity into consumption.

Our findings are crucial for understanding the recent rise of BNPL and have important policy implications. First, one fundamental difference between BNPL and traditional consumer credit is that FinTech companies enjoy the information advantage of having users' digital footprints, which helps them reach long-tail customers and provides them financial access for the first time. While the general perception in consumer-credit studies is that consumption only increases when consumers use new credit, our study documents that unused credit also boosts consumption. This emphasizes the liquidity-insurance role of first-time credit access, which is crucial in evaluating the benefits brought by FinTech. Second, while one major concern of BNPL is increased overall leverage in the household sector, we find that the consumption-boosting effect does not necessarily come at the cost of household indebtedness. Our findings not only complement the consumption-boosting effect documented in Bian, Cong and Ji (2023), but also align with one of the main findings based on transaction-level data in Bian, Cong and Ji (2023) regarding users' cautious usage of BNPL when incurring interest. The overspending and overindebtedness might be attributable to factors beyond BNPL itself, such as excessive promotion with extra benefits, inappropriate advertising, or unregulated competition in BNPL industries. Regulators need to be careful to preserve the benefits of BNPL. Meanwhile, the liquidity-insurance role suggests BNPL providers are not earning money from their consumers, as few consumers actually use it and pay interest. This pattern echoes the surveys and reports showing that BNPL providers are making money mainly from retail merchants.[17] Therefore, regulators should pay attention to merchant protection and not just consumer protection.

Our findings should be received with a few caveats in mind. First, the analysis is based on a two-month experiment, which is short and leaves us unable to isolate short-term effects from long-term effects. Second, the users in the experiment are restricted to residents of second- and lower-tier cities in China. So our findings may fail to apply to well-developed areas in developing countries and to developed countries since BNPL might serve a different function in such places, where most users are not first-time borrowers. To analyze the interaction between BNPL and credit cards, transaction data is needed (see Bian, Cong and Ji, 2023). These caveats represent future opportunities for research.

Data availability

The authors do not have permission to share data.

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[17] For example, see BBC report https://www.bbc.com/news/explainers-59582188, accessed on August 11, 2022.

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