The Rise of E-Wallets and Buy-Now-Pay-Later: Payment Competition, Credit Expansion, and Consumer Behavior

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1. Introduction

- The past decade has witnessed a phenomenal rise of e-wallets worldwide.
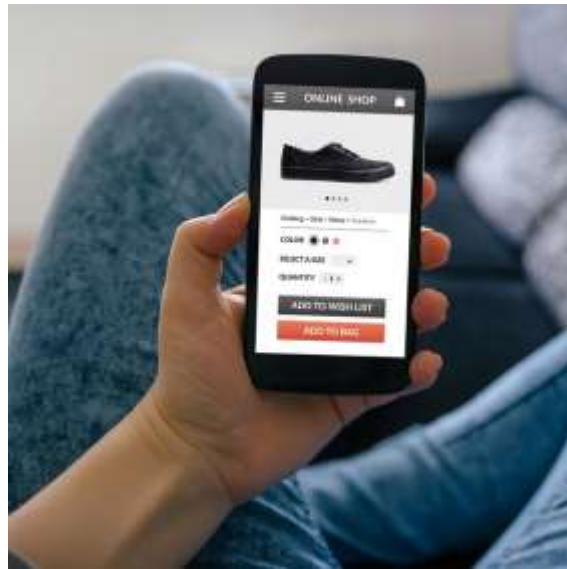- FinTech firms often start with payment (Frost et al., 2019; Hong, Lu, & Pan, 2023).

E-wallets (digital wallets)

- World-wide adoption; COVID-19 pandemic accelerates the usage.

Source: https://www.theguardian.com/world/gallery/2020/may/30/how-we-live-now-social-distancing-across-the-globe-in-pictures

Online
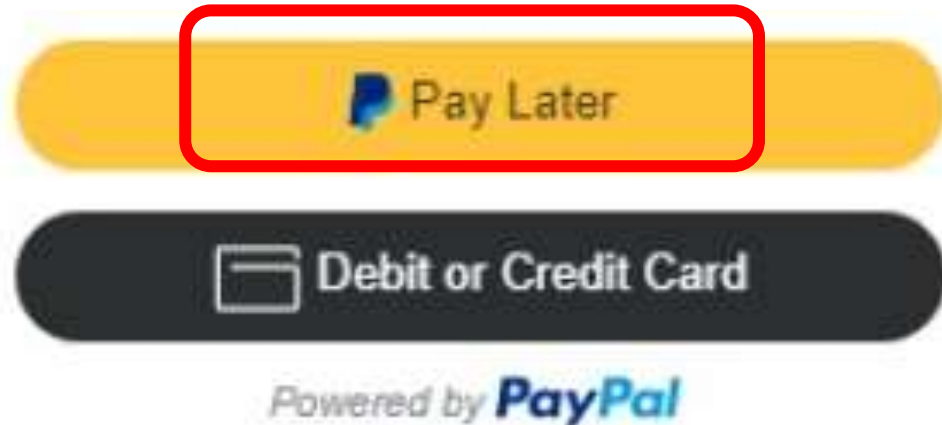
On-site
(physical stores)

One e-wallet to rule them all.

The Game Changer in E-Wallet:

Buy Now Pay Later (BNPL)

Pay Later in PayPal

Check Later in Alipay

- A short-term FinTech consumer credit at POS.
- BNPL is projected to account for $680 billion in global transactions by 2025.

Buy Now, Pay Later (BNPL)

The Economist — Finance & economics — Oct 10th 2019 edition >
Creditworthy
A group of fintech firms are changing the way consumers borrow

- Together with the rise of e-wallets is the emergence of BNPL.

- Short-term FinTech credit allowing customers to defer payments interest free into several installments at POS.

US

Australia

Sweden

Buy Now, Pay Later (BNPL)

✓ BNPL is not new and even has a longer history than credit cards.

✓ What is new in the BNPL model we study?

1. Embedded in a e-wallet and are in digital form (scale)

2. Born in a super app with its own ecosystem (innovation)

MARTHA L. OLNEY

BUY NOW IT'S Easy

I'LL GRAB THAT $

PAY LATER

Advertising, Credit, and Consumer
Durables in the 1920s

BNPL matters for e-wallets:
- Without BNPL, e-wallets are mainly *bridges to banks*;
- With BNPL, e-wallets become *independent credit providers*.

To evaluate e-wallets' economic impacts:
- Does BNPL *crowd out* linked bank cards?
- Does BNPL *extend credit* **access** to underserved consumers?
- Does BNPL *increase spending and debt*?

A brief overview

Unique data: a leading e-wallet provider in China

- Direct information on BNPL: Access, acceptance, and usage

- Over 1 million transactions in 2020: Online and on-site

- A randomized experiment in 2017: Randomly assigning BNPL to users
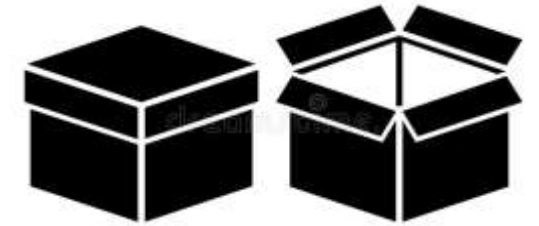
Key findings:

- *Payment competition*: BNPL accounts for more than half of all transactions in our sample.

- *Credit expansion*: Around 80% consumers have access to BNPL and nearly all online merchants accept BNPL.

- *Cautious usage*: Users carefully moderate borrowing when incurring interest charges.

Literature
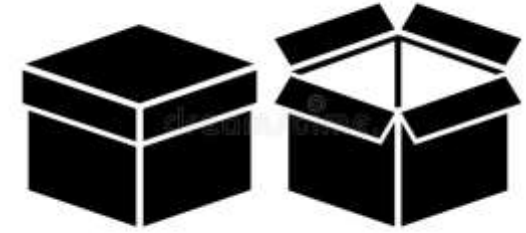
- FinTech credit (e.g., Tang 2019) and payments (Agarwal et al., 2022).
    - Payment data are fundamental for credit ratings/lending
      (Berg, Fuster, and Puri, 2022; Ghosh, Vallee, Zeng, 2022).
    - Payment surveys focuses on advanced economies; e-wallets/digital payments as an aggregate category (Arango et al., 2015; Koulayev et al., 2016; Wang et al., 2016; Agarwal et al., 2020b)
- First transaction-level analysis of e-wallets and BNPL.
- Add to emergent literature on FinTech credit (e.g., Huang et al., 2018; Hau et al., 2019; Hau et al., 2021), emphasizing consumers and households.
- BNPL and the economic implications of its meteoric emergence (e.g., Di Maggio et al., 2022; deHaan et al., 2022; Guttman-Kenney et al., 2023; Berg et al., 2023); matched transaction-level e-wallet and BNPL data and randomized experiment.
- Complement earlier research on mobile payment, consumer credit, and overspending (Aydın, 2022; Gross and Souleles, 2002; Ponce, Seira, and Zamarripa, 2017; Agarwal et al., 2020b).

Data

- Transaction-level data from a leading e-wallet provider in China
  - Randomly drawn from *all* its transactions in June, 2020
  - 550,000 online transactions and 550,000 on-site transactions
  - Representative of population aged 16-60
  - Merchant- and consumer-side characteristics

- A BNPL randomized experiment conducted by the same e-wallet provider
  - A two-month experiment in June and July, 2017.
  - On June 1, 2017, the company assigned some users to the treatment group; these individuals were offered BNPL and were notified of their new credit limits immediately. The users in the control group had no access to BNPL and had no such anticipation.
  - In August 2017, the control group was granted BNPL as well.
  - A subsample of users in the experiment, including 700,000 user-month observations for 100,000 users between January and July 2017.
  - 50,000 users in the treatment group and 50,000 users in the control group matched primarily on consumption.

Data: Pre-trend for the 2017 experiment

Parallel pretrends of monthly consumption

Ratio of monthly consumption of treated to controlled users
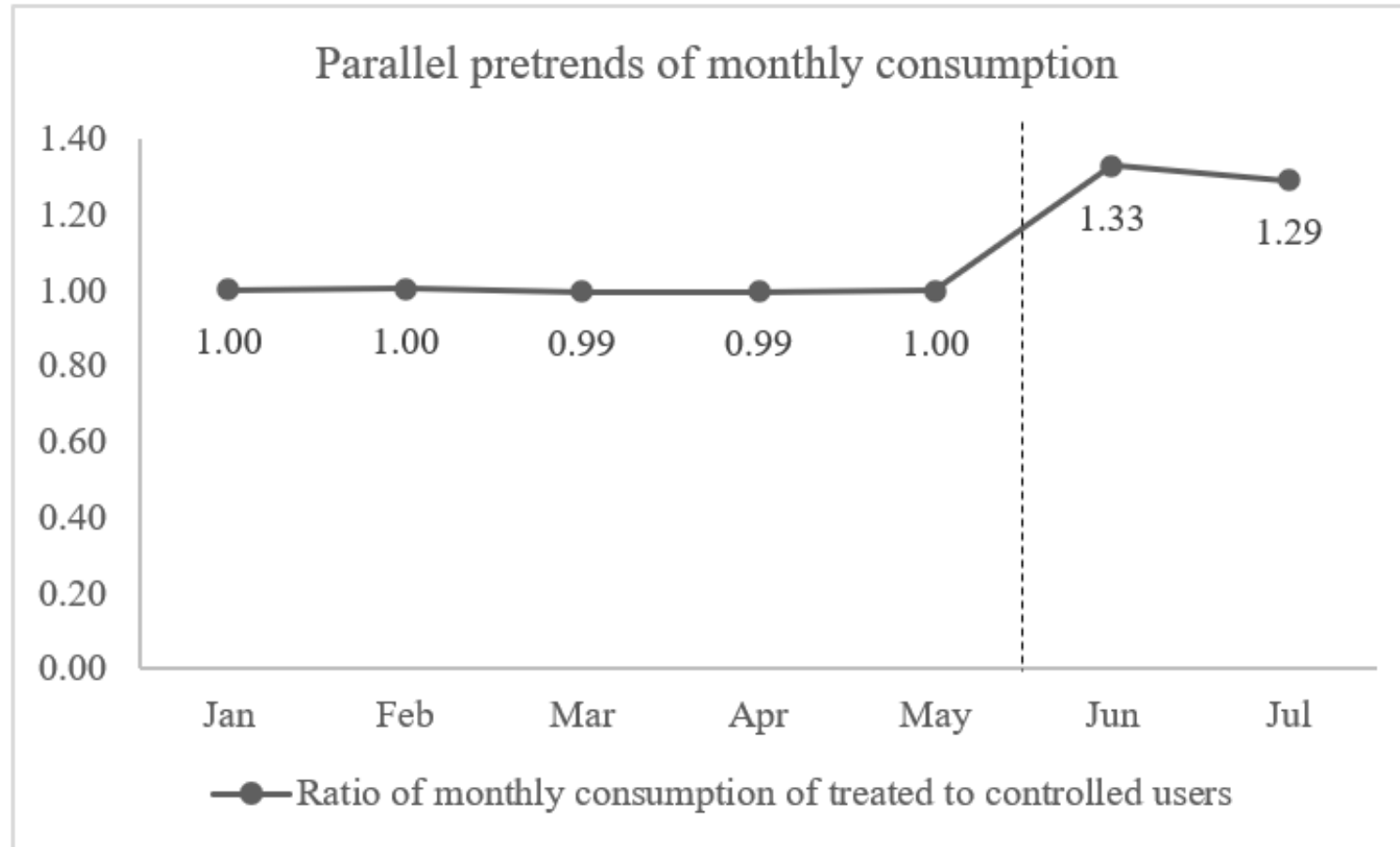
3. Payment competition

Five payment options within the e-wallet:

➢ Linked credit card
➢ Linked debit card ⟶ *External* options
as bridges to banks

➢ E-wallet balance ⟶ *Internal* options
➢ E-wallet saving cutting banks off information
➢ E-wallet credit (BNPL)

Which group dominates in e-wallet transactions?

Internal payment options dominate the ecosystem.
E-wallet transactions largely bypass banks.
Motivations for open FinTech / CBDCs?

Online transactions

External
36%

Internal
64%

On-site transactions

External
18%

Internal
82%
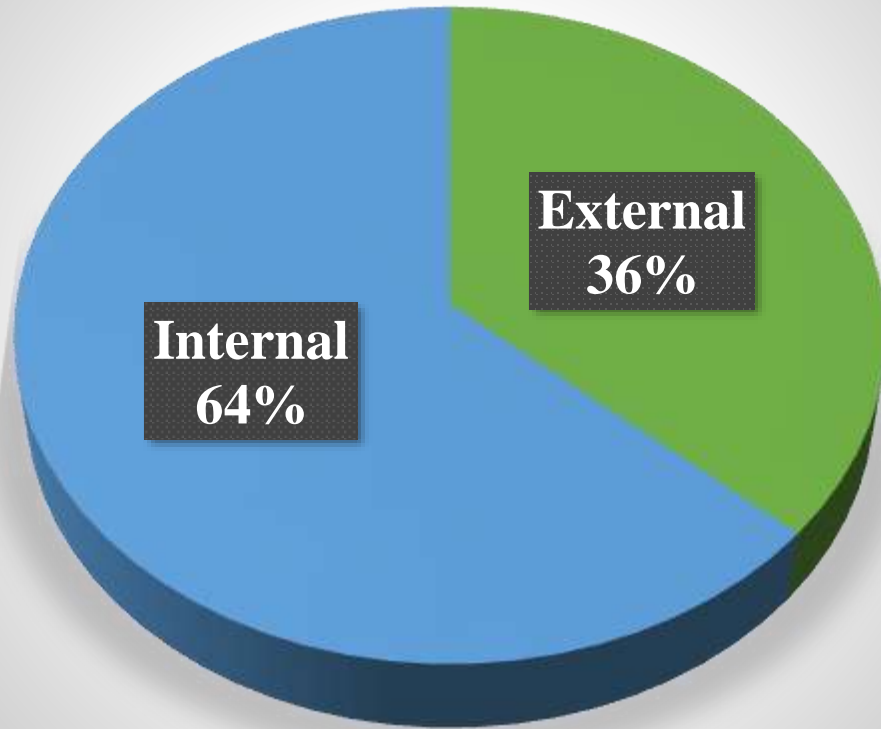
The most popular payment choice: BNPL

Online transactions
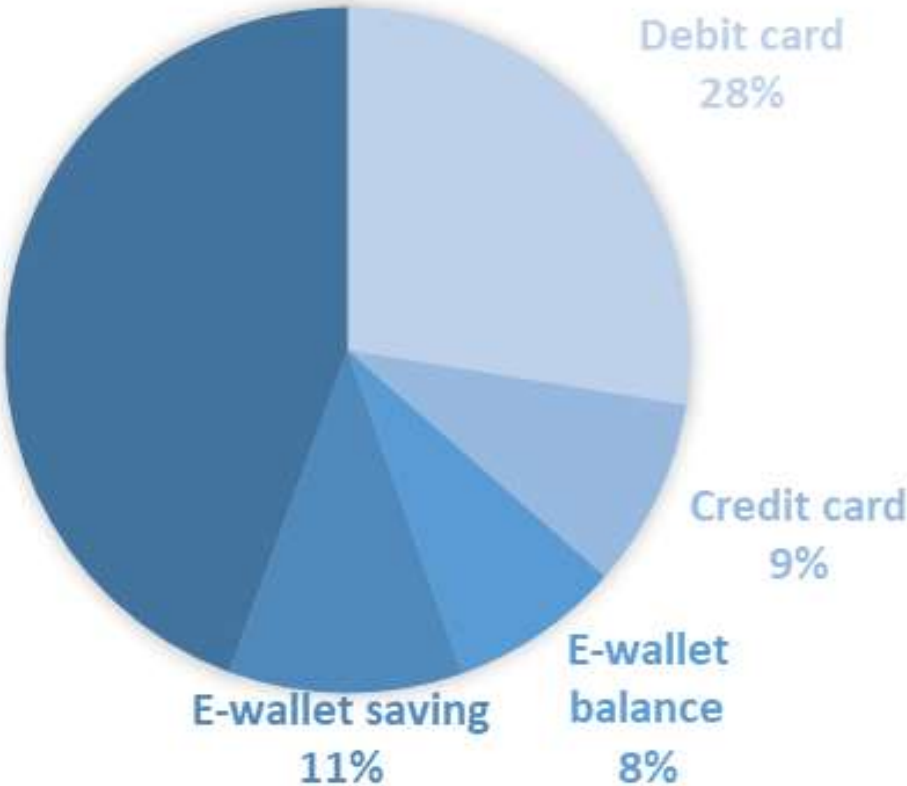
On-site transactions
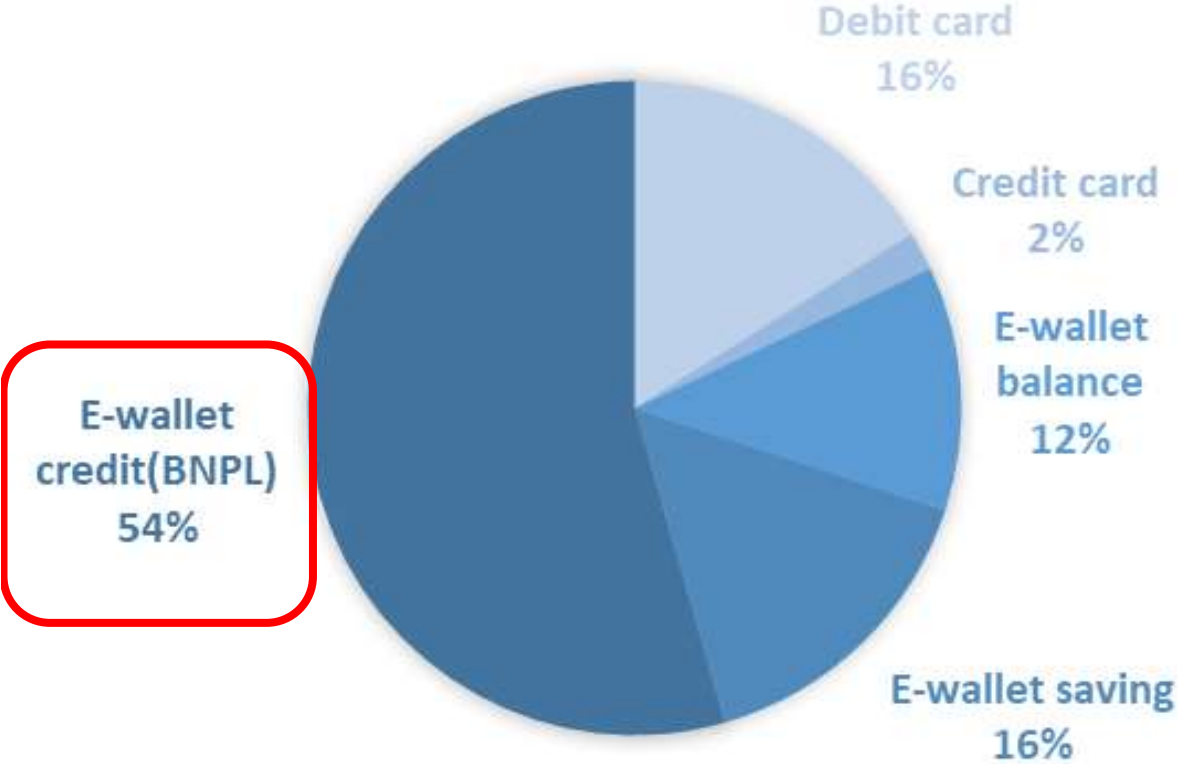
Note that Berg et al. (2023) find that BNPL dominates the payment choices (51%) for a large furniture merchant in Germany, which is consistent with our finding.

Payment competition from another aspect:
Impacts of BNPL Access on Payment Choices

Y: payment methods in the e-wallet

X: Customer access and merchant acceptance to BNPL

Controls:
Consumer: gender, age, wealth
Merchant: sales, industry
Transaction: transaction value
Payment: default payment option, payment adoption length

Table 8. Payment-option choices for on-site transactions

	Payment options				
	BNPL (1)	Credit cards (2)	E-wallet balance (3)	E-wallet savings (4)	Debit cards (5)
D_Customer_BNPL[d]	0.675***	-0.021***	-0.121***	-0.157***	-0.143***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
D_Customer_CC[d]	0.042***	0.063***	-0.040***	-0.040***	0.014***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
D_Merchant_BNPL[d]	0.048***	0.001**	-0.002**	0.007***	-0.010***
	(0.000)	(0.039)	(0.025)	(0.000)	(0.000)
D_Merchant_CC[d]	-0.045***	0.049***	-0.015***	-0.011***	0.045***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
D_preferred_option[d]	0.339***	0.021***	0.112***	0.227***	0.268***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Option_adoption_length	-0.000***	0.000	-0.000***	-0.000***	0.000***
	(0.000)	(0.390)	(0.000)	(0.000)	(0.000)
Age	0.002***	-0.001***	-0.001***	-0.005***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender[d]	-0.011***	0.003***	-0.003***	-0.007***	0.005***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Log(Transaction value+1)	-0.033***	0.001***	0.003***	0.003***	0.021***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(monthly sales)	-0.015***	-0.001***	-0.005***	-0.006***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(cashflow+1)	-0.027***	-0.004***	0.020***	0.012***	-0.013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(wealth+1)	0.010***	0.000***	-0.024***	0.021***	-0.008***
	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)
Industry FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES
Observations	501,801	501,801	501,801	501,801	501,801
Pseudo-R^2	0.25	0.41	0.20	0.15	0.14

Notes: 1. Subscript d indicates dummy variables. 2. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	Payment options				
	E-wallet credit (BNPL) (1)	Credit cards (2)	E-wallet balance (3)	E-wallet savings (4)	Debit cards (5)
D_Customer_BNPL[d]	0.675***	**-0.021***	**-0.121***	**-0.157***	**-0.143***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

The access to BNPL is negatively related to the usage of ALL other payment options.

Notes: 1. Subscript *d* indicates dummy variables. 2. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

	Payment options				
	E-wallet credit (BNPL) (1)	Credit cards (2)	E-wallet balance (3)	E-wallet savings (4)	Debit cards (5)
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	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(Transaction value+1)	-0.033***	0.001***	0.003***	0.003***	0.021***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Consumers use BNPL in low-value transactions.
BNPL has the potential to be the new cash.

- BNPL frequently being used for small transactions differs from credit cards.
- Evidence from *dual access users*: users who have both FinTech credit and bank credit.
- Credit cards for large purchases and BNPL for small purchases.

(on-site)

User type:	Single-access users	Dual-access users	
Payment method	BNPL	BNPL	Credit card
	(1)	(2)	(3)
D_Merchant_BNPL[d]	0.026***	0.037***	−0.010***
	(0.000)	(0.000)	(0.000)
D_Mercent_CC[d]	−0.051***	−0.104***	0.197***
	(0.000)	(0.000)	(0.000)
Log(1+transaction value)	−0.029***	−0.048***	0.005***
	(0.000)	(0.000)	(0.000)
Controls	YES	YES	YES
Industry FE	YES	YES	YES
Day FE	YES	YES	YES
Observations	304,137	144,133	144,133
Pseudo-R^2	0.13	0.13	0.38

19

(online)

User type:	Single-access users	Dual-access users	
Payment method	BNPL	BNPL	Credit card
	(1)	(2)	(3)
Log(1+transaction value)	-0.000	-0.005***	0.019***
	(0.896)	(0.000)	(0.000)
Controls	YES	YES	YES
Industry FE	YES	YES	YES
Day FE	YES	YES	YES
Observations	281,300	151,836	151,836
Pseudo-R^2	0.09	0.11	0.08

BNPL for daily small transactions.
Super-app credit taking the place of cash.

- Previous research using data before 2020: despite new technologies for electronic payments, cash remains popular in small transactions (Alvares and Argente, 2022; Brown et al., 2022).

- Our research focuses on an economy which has already become cashless, and the results suggest that within the super-app, BNPL is used for small-valued daily payments.
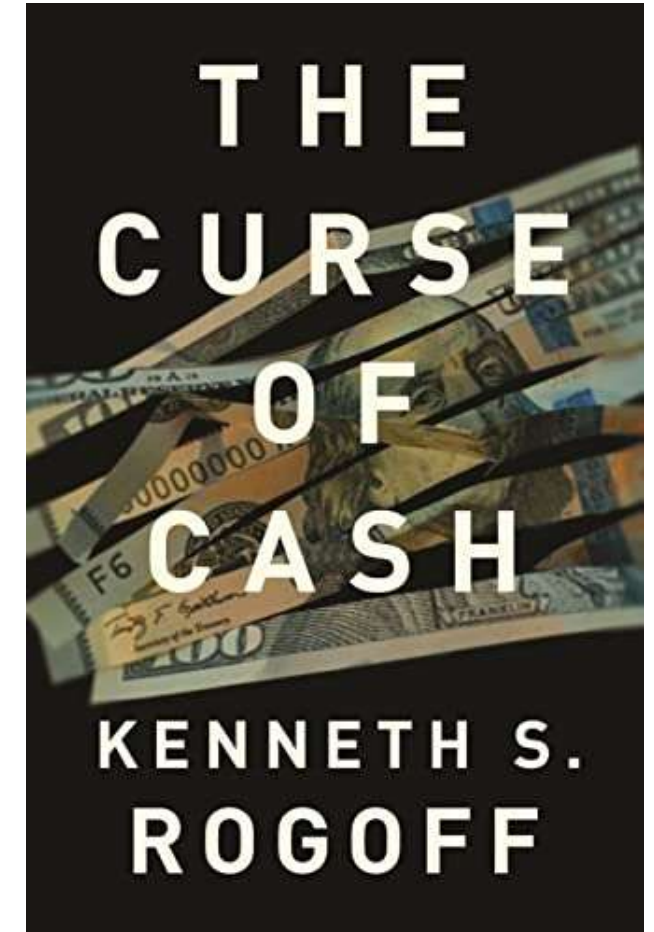
4. Credit Expansion and Financial Inclusion

BNPL usage in daily transactions

>Credit expansion on consumer side

One core empirical challenge in FinTech lending literature:

Whether FinTech borrowers have access to bank credit.

Tang (2019), Jagtiani and Lemieux(2019), and Di Maggio and Yao (2021) indirectly infer the composition of FinTech borrowers.

Our data directly observes whether a BNPL user has linked bank credit cards.

>Credit expansion on merchant side

A new perspective of FinTech credit.

Our data directly observes merchants' acceptance of credit cards and BNPL.

BNPL Expands Consumer Credit at the extensive margin

Some descriptive evidence (see Tables 7-11 for more details)

- From the consumer side, nearly 70% consumers have no linked credit cards, but more than 80% of them have BNPL access.

- From the merchant side, about 81.79% on-site merchants do not accept credit cards, but 43.54% of them accept BNPL.

- From the transaction side, 91.59% (64.44%) of on-site (online) transactions cannot be completed with credit cards. However, 44.37% (90.21%) of them can be completed with BNPL.

- Credit card usage is significantly lower in less developed regions and for women. BNPL alleviates the inequality in access of bank consumer credit between well-developed and less-developed areas.

BNPL Expands *Consumer* Credit Access at the extensive margin

Expansion of e-wallet credit from consumers' side

Consumers	On-site	Online
Panel A: Without credit cards	70.43%	68.31%
% of the above with e-wallet credit (BNPL)	84.14%	78.38%
Panel B: With credit cards	29.57%	31.69%
% of the above with e-wallet credit (BNPL)	94.93%	90.91%
Panel C: With e-wallet credit (BNPL)	87.32%	82.28%
% of the above with credit cards	32.14%	35.02%

Nearly 70% consumers have no linked credit cards, but more than 80% of them have BNPL access.

Merchants' *Adoption* of BNPL at the extensive margin (on-site)

The expansion of e-wallet credit from merchants' side

Merchants	On-site	Online
Panel A: Do not accept credit cards	81.79%	1.08%
% of the above that accept e-wallet credit (BNPL)	43.54%	80.56%
Panel B: Accept credit cards	18.21%	98.92%
% of the above that accept e-wallet credit (BNPL)	83.42%	99.37%
Panel C: Accept e-wallet credit (BNPL)	50.81%	99.17%
% of the above that accept credit cards	29.90%	99.12%

Nearly 81.79% on-site merchants do not accept credit cards, but 43.54% of them accept BNPL.

Two-sided payment market:
a big difference between credit cards and BNPL

Efficient credit expansion: combining consumers' and merchants' sides

Transactions	On-site	Online
Panel A: Cannot use credit cards	91.59%	64.44%
% of the above that can use e-wallet credit (BNPL)	44.37%	90.21%
Panel B: Can use credit cards	8.41%	31.56%
% of the above that can use e-wallet credit (BNPL)	75.62%	90.46%
Panel C: Can use e-wallet credit (BNPL)	47.00%	81.68%
% of the above that can use credit cards	13.53%	34.95%

Credit cards: 92% of on-site transactions and 64% of online transactions **CANNOT** completed with credit cards.
BNPL: 47% on-site transactions and 82% online transactions can be completed with BNPL.

Financial inclusion:
which credit helps consumers more in less developed areas?

(Y: consumer credit usage; X: BNPL access \ bank credit access × less developed)
BNPL access has a *larger impact* on consumer credit usage in *less-developed regions*.

Table 12. The determinants of consumer credit usage in different regions

	Credit usage			
	On-site transactions		Online transactions	
	(1)	(2)	(3)	(4)
	Rural	North	Rural	North
D_Consumer_BNPL[d] *Less_deveoped[d]*	0.113***	0.116***	0.142***	0.075***
	(0.000)	(0.000)	(0.000)	(0.000)
D_Consumer_CreditCard[d] * *Less_developed[d]*	-0.003	-0.000	-0.064***	-0.006**
	(0.248)	(0.870)	(0.000)	(0.024)
Control variables	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Day FE	YES	YES	YES	YES
Pseudo R^2	0.229	0.230	0.219	0.218
Observations	501,598	501,801	512,505	512,803

5. Consumption and debt

Frequent BNPL usage:
➢ Additional liquidity buffer could increase consumption,
➢ Overusing the credit might lead to indebtedness.

A randomized experiment:
Post: From June to July 2017, the e-wallet provider conducted a two-month experiment.
Treat: The company randomly assigned some users to the treatment group; these individuals were offered BNPL. The users in the control group had no access to BNPL.

Our data set is a subsample of users in the experiment. The e-wallet provider randomly drew 50,000 users from the original treatment group and 50,000 users from the original control group.

Consumption of the treated group increases by RMB 86,
corresponding to approximately 5.62% of total average monthly consumption
(0.086/1.53) of Chinese consumers.

Table 13. The impact of BNPL on consumer spending

	Dependent variable: consumption (monthly, thousand RMB)			
	(1)	(2)	(3)	(4)
	Full sample	Single-access	Dual-access	Dual-access (credit card consumption)
Treat×Post	0.086***	0.085***	0.204***	0.038***
	(0.002)	(0.002)	(0.047)	(0.009)
Ln_cashflow	0.014***	0.014***	0.044***	-0.0008
	(0.0003)	(0.0003)	(0.005)	(0.001)
User fixed effects	YES	YES	YES	YES
Month fixed effects	YES	YES	YES	YES
Observations	700,000	695,149	4,851	4,851
R^2	0.225	0.226	0.199	0.276

Notes: ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

The heterogeneity of the consumption-boosting impact (Life-cycle/PIH?   Rule-of-thumb/Hand-to-mouth? Buffer-stock.)
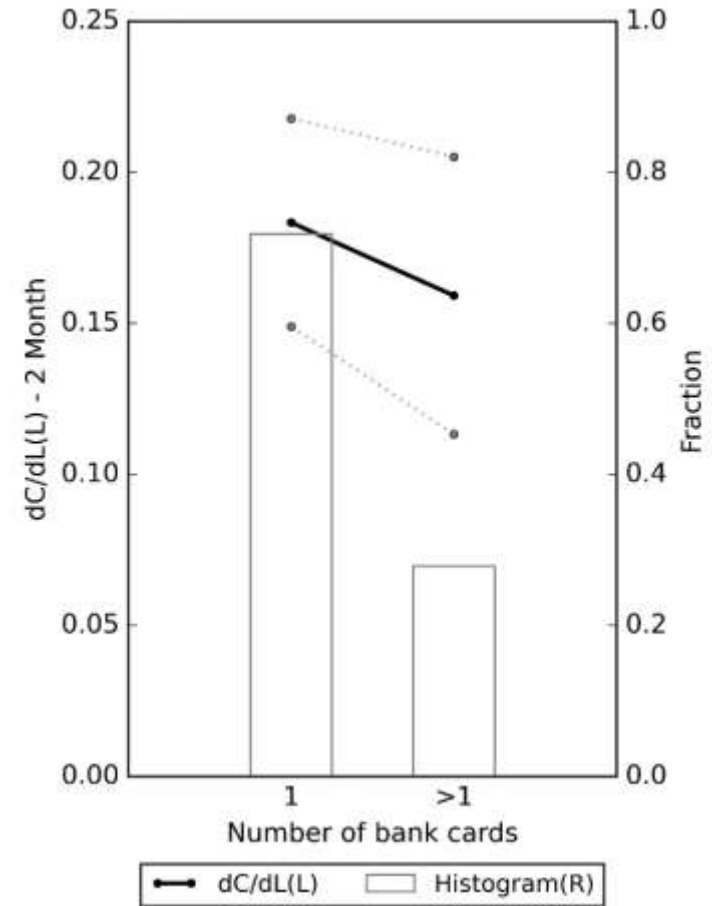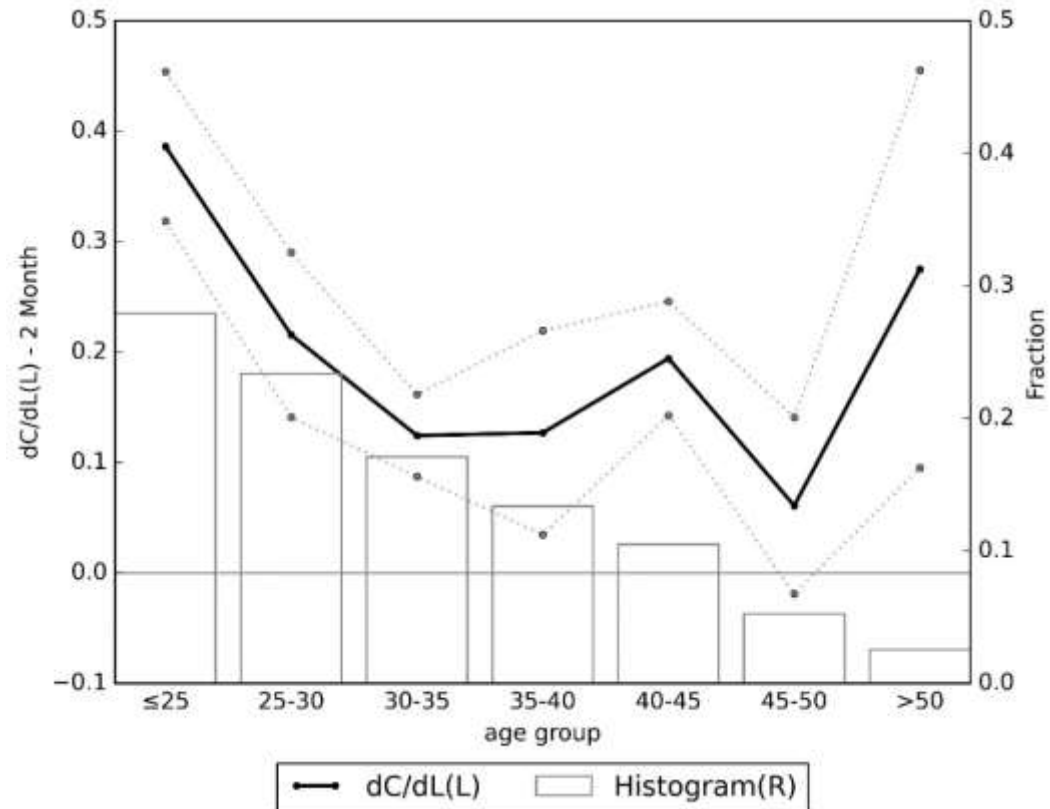
Overspending and indebtedness:
- **No interest**: 65% consumers are only transactors, using BNPL as a payment tool.
- **Once incur interest:** increase or reduce BNPL usage?   (revolvers or transactors?)

Users reduce BNPL usage when incurring interest charges.
→ **back to transactors**.

Table 14. The impact of incurring interest on the usage of BNPL as the payment instrument in

	on-site transactions			online transactions		
	The dependent variable: a dummy variable indicating whether BNPL is used in an on-site transaction			Dependent variable: a dummy variable indicating whether BNPL is used in an online transaction		
	(1)	(2)	(3)	(1)	(2)	(3)
D_Unpaid_BNPL^d	−0.060***			−0.026***		
	(0.000)			(0.000)		
Log(1+Unpaid BNPL debt)		−0.008***			−0.003***	
		(0.000)			(0.000)	
Unpaid BNPL debt %			−0.184***			−0.180***
			(0.000)			(0.000)
Control variables	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Day FE	YES	YES	YES	YES	YES	YES
Observations	448,270	442,493	393,482	433,136	425,028	352,403
Pseudo-R^2	0.13	0.13	0.11	0.10	0.09	0.07

Motivations: for higher credit line, higher credit scores, access to more functions in the e-wallet ecosystem.

Frequent yet responsible BNPL usage helps users gain ecosystem access

Table 17. The impact of BNPL usage on users' utilization of other services in the e-wallet

	(1) Credit Scores	(2) Credit limit in another lending service (2021average)	(3) Credit limit in BNPL (2021average)	(4) Deposit-free rental services
BNPL usage	0.0279*** (0.000)	0.5569*** (0.000)	0.2277*** (0.000)	0.0041* (0.0505)
BNPL usage × High_Debt	-0.0257*** (0.000)	-0.5443*** (0.002)	-0.2165*** (0.000)	-0.0041* (0.0513)
User fixed effects	YES	NO	NO	YES
Month fixed effects	YES	NO	NO	YES
Observations	2,903,771	40,384	62,655	449,534

Notes: P values in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. The credit score data starts from Jan 2017, the rental services data starts from Jul 2020; the credit limit data is a cross-sectional level data of Dec 2021.

Takeaways

The economics of BNPL in a super-app ecosystem.

Payment competition in the e-wallet

Platform/ecosystem internal credit

3. Consumption increase without indebtedness.

1. BNPL wins.

Consumer behavior in the ecosystem

Credit expansion on the platform

2. Consumer access and merchant acceptance.