

# **Learning in the Limit: Income Inference from Credit Extension**

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# Large Spending Responses to Credit Limit Extension

- Credit limit underpins how much consumers can borrow for consumption.
  - more than  $1/3$  of consumers have positive consumption debt.

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- expect non-trivial spending effects **only if** (almost) borrowing constrained.
- In reality: \$1 credit limit ⇒ **\$0.4** consumption (Agarwal et al. 2017)
  - strong reaction for high-liquidity consumers.

Gross and Souleles (2002), D'Acunतो et al. (2020), Aydin (2022), etc.

- Open question: consumption responses to credit limit extensions.

# Information Content of Credit Supply

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standard estimation: random shocks to borrowing limits.

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- Do consumers infer information from credit limit extension?

if yes, debt/spending decisions?

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- Assign to treatment & control



**6.19 – 6.23**

Year 2023

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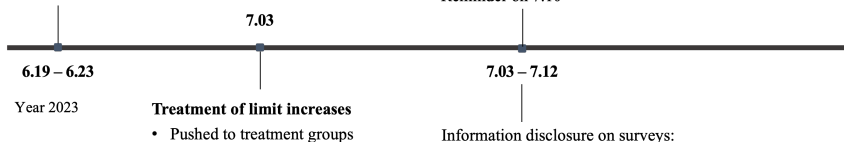
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- Reminder on 7.10



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## Limit increases to controls



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# Data

- Survey data

**without** surveys: 4,281 in total, 2,331 treated.

**with** surveys: 6,057 in total: 3,356 treated.

- expectations of future income, saving, consumption, default, etc.

- Bank account data:

demographics, transaction histories, etc.

two types of income

- **salary** (70.48%): deposited monthly income/social security insurance.
- **business income** (29.52%): net inflow labeled as business operations.

- Credit registry:

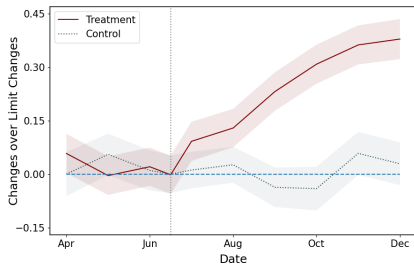
interest-incurring unsecured debt from **all** financial institutions

## Summary Statistics

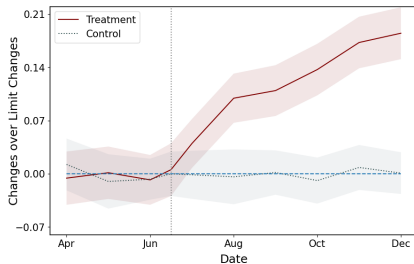
	Mean	SD	N	Mean	SD	Diff	<i>t</i> -stats	N
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Control			Treatment				
Age	37.91	10.25	1588	37.62	9.50	-0.29	-0.74	1875
Female	0.43	0.50	1588	0.41	0.49	-0.02	-1.01	1875
College	0.46	0.50	1588	0.47	0.50	0.02	0.92	1875
Income	9.69	8.74	1588	9.48	6.99	-0.21	-0.65	1875
Saving	139.05	149.84	1588	139.91	138.71	0.86	0.15	1875
Debt	7.40	13.37	1588	7.01	10.10	-0.39	-0.79	1875
Debt Debt>0	16.54	15.76	711	16.99	8.81	0.45	0.54	774
Limit	23.25	27.19	1588	22.33	26.53	-0.92	-0.81	1875
Δ Limit	12.01	9.09	1588	11.73	8.20	-0.29	-0.82	1875
Spending	7.77	13.57	1588	7.94	12.92	0.17	0.32	1875
Income	9.61	9.60	1588	9.54	7.75	-0.07	-0.19	1875
Liquid Wealth	155.59	266.48	1588	150.71	188.84	-4.88	-0.53	1875
Total Wealth	431.39	900.12	1588	426.85	678.23	-4.54	-0.14	1875

# Evolution of Spending and Debt

## Total Spending



## Unsecured Debt



- Spending is from a single institute – coverage?

- Focus on main users:

1. answered **one** to:

*How many banks do you usually use for transaction purposes?*

2. at least 15 spending transactions each month



# MPB and MPCL

	Panel A: 3 Months		Panel B: 6 Months	
	$\Delta B$ (2)	$\Delta C$ (4)	$\Delta B$ (6)	$\Delta C$ (8)
Treatment	0.106*** (0.008)	0.212*** (0.031)	0.179*** (0.014)	0.393*** (0.048)
N	8037	8037	8037	8037

- Over six months, each CNY increase in credit limit increases
  - spending by **0.393 CNY** (Agarwal et al. 2017)
  - unsecured debt by **0.179 CNY** (Agarwal et al. 2017, Aydin 2022)

# Elicit Belief Changes with Surveys

- Theories for consumption responses to limit changes:

limit  $\Rightarrow$  improves consumption smoothing  $\Rightarrow$  lower saving

- Test theories: do subjective expectations align?

- Post-experiment surveys:

- spending:

*Over the next 12 months, how much would you most likely **spend** on average every month (excluding investment and purchases over durable goods including housing, cars, etc.)?*

- income:

*Over the next 12 months, conditional on not switching jobs, what's the level of total **income** you are most likely to get?*

- Similar questions for wealth, hours to work, unemployment, default prob, etc.

## Changes in Expectations

	$\Delta E[C]$ (1)	$\Delta E[Y]$ (2)	$\Delta E[\text{Liq. } W]$ (3)	$\Delta E[\text{Total } W]$ (4)
Treatment	0.267** (0.117)	0.323*** (0.078)	0.001* (0.000)	0.001 (0.001)
N	8037	8037	8037	8037

- After positive limit shocks, consumers expect
  - **higher** spending and income.
  - **unchanged** total saving.
- Inconsistent with conventional economic theories.

# Changes in Expectations

	$\Delta E[\text{Hours}]$ (1)	$E[p(\text{unemp.})]$ (2)	$E[p(\text{default})]$ (3)	$\Delta E[\text{Limit} - 6\text{M}]$ (4)	$\Delta E[\text{Limit} - 5\text{Y}]$ (5)
Treatment	0.000 (0.000)	-0.185* (0.107)	-0.053 (0.094)	67.656 (881.117)	-323.508 (1437.581)
N	8037	8037	8037	8037	8037

- No reported higher defaults
- Unchanged hours planned to work
  - ⇒ no change in labor supply
- lower unemployment probability
  - ⇒ higher labor demand
- Not expecting higher credit limits.

# What Does This Tell Us?

- Existing theories: higher limits
  - reduce the need for precautionary saving  
Agarwal et al. 2017, Aydin 2022
  - increases self-employment or labor mobility  
Doornik et al. 2021, Herkenhoff et al. 2021

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- Survey evidence:
  - more spending financed by **higher** income
  - higher income from **higher** productivity/labor demand
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- Survey evidence:
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  - **unchanged** savings and hours planned to work
- Consistent with Inferring info from credit supply
  - consumers imperfectly informed about economic conditions  
Mankiw and Reis 2002, Reis 2006, Coibion and Gorodnichenko 2012, Andre et al. 2022
  - infer (heter. impacts of) macro conditions from pro-cyclical credit supply  
Bassett et al. 2014, Fishman et al. 2020, Weitzner and Howes 2023

# Inference about Macroeconomy

- Should update expectations about macroeconomic variables

*Q: How much will the overall **Chinese economy/unemployment rate** change (in percentage relative to the current level) over the next year?*

- Larger income expectation changes if more uncertain

*Q: How confident are you in evaluating whether the **overall economy** is functioning well at the moment?*

- low Macro Uncertainty if answered *very confident*
- study changes in income expectations by Macro Uncertainty



# Income Expectation Changes by Macro Sensitivity

	E[ $\Delta$ GDP]	E[ $\Delta$ Unemp Rate]	E[ $\Delta$ Y]	E[ $\Delta$ Y]
			Macro Uncertainty	
	(1)	(2)	Low (3)	High (4)
Treatment	0.046*** (0.017)	-0.231*** (0.063)	0.199 (0.231)	0.446** (0.228)
N	2310	2310	943	1367

- Consistent with inferring macro conditions
  - limit increase  $\Rightarrow$  expansionary economy
  - low macro uncertainty  $\Rightarrow$  insignificant expectation changes

# Heterogeneity by Income Volatility

- Distinguishing between learning and other stories:
  - learning about income **only when** income is volatile
- Zero income variations  $\Rightarrow$ 
  1. unchanged income expectations
  2. smaller debt/spending changes
- Estimate ATE respectively for
  1. **zero** income variations previous year
  2. **positive** income variations previous year

## Heterogeneity by Income Volatility

	$\Delta B$ (1)	$\Delta C$ (2)	$E[\Delta Y]$ (3)	$\Delta B$ (4)	$\Delta C$ (5)	$E[\Delta Y]$ (6)
	Panel A: $SD(Y) = 0$			Panel B: $SD(Y) > 0$		
Treatment	0.081*** (0.025)	0.249*** (0.083)	-0.031 (0.030)	0.172*** (0.018)	0.433*** (0.060)	0.610*** (0.118)
N	1165	1152	1141	4326	1068	3984

- Much smaller effects when income has zero variations

# Conclusion

- Credit extension **increases** consumer **income expectation**.
  - clean identification with RCT.
- Expectations with respect to labor **demand/productivity**.
  - no changes in expected labor **supply**.
- Consumers associate credit supply with **macro** movements.
  - significant changes in macro expectations.
  - **unchanged** income expectations if **low** macro uncertainty
- Things for the future:
  - supply-driven credit cycle with learning.