Mutual Risk Sharing and FinTech: The Case of Xiang Hu Bao

Hanming Fang, Xiao Qin, Wenfeng Wu, and Tong Yu

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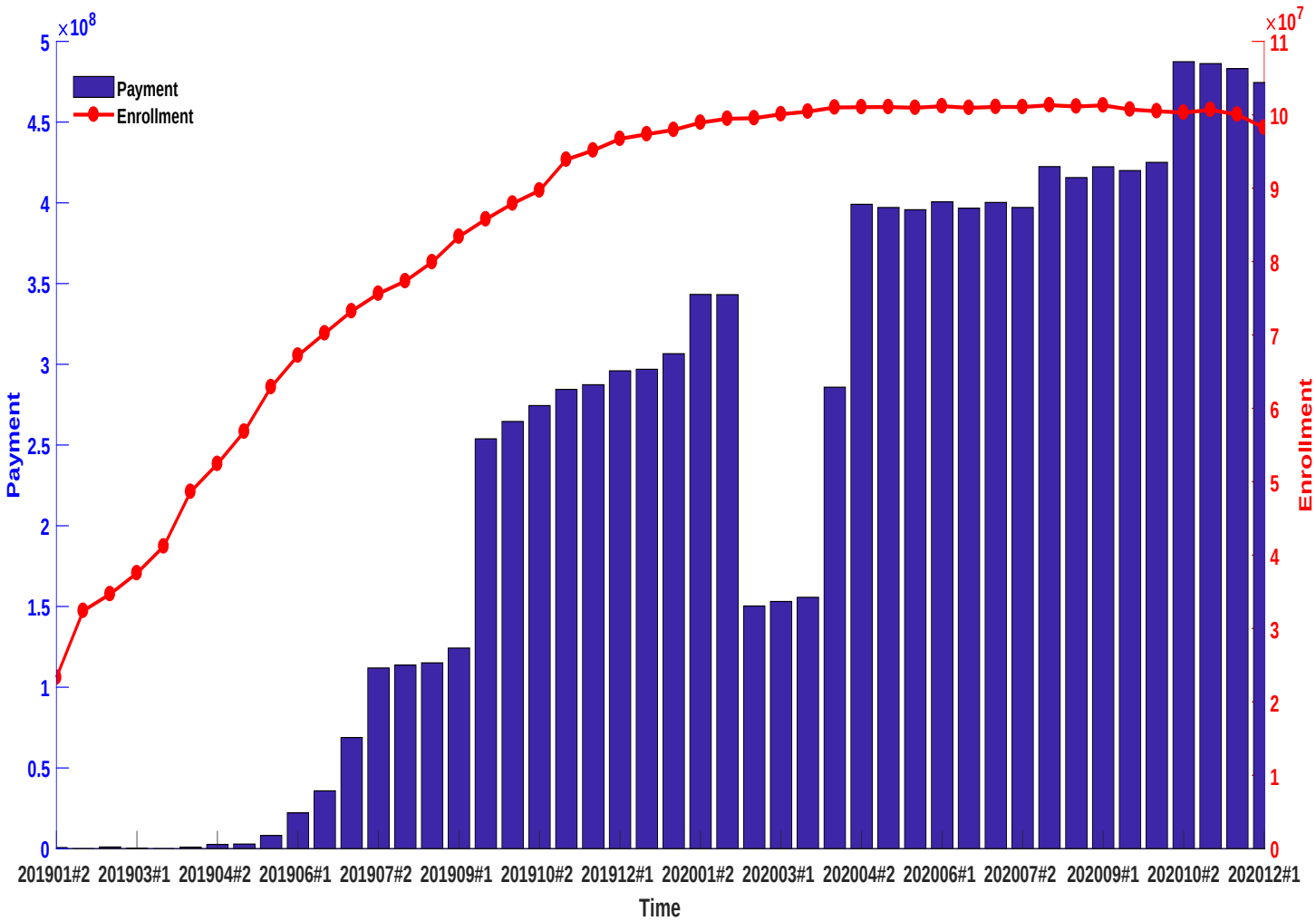
Motivations

- A cornerstone of insurance is pooling/diversification
- Mutuality principle (Borch, 1962)
  - In a frictionless market, it is optimal for participants to pool idiosyncratic risks and mutually share risks
  - Market risks are allocated among participants based on risk tolerance
- Reality:
  - Mutual risk sharing is missing
  - insurance companies play a central role in managing risks, setting premiums for policyholders with a goal to maximize their value (Marshall, 1974)
    - Opaque; high operating and regulatory compliance costs $\Rightarrow$ high premium
    - Insurers' operating expenses account for about one third of insurance premiums charged by U.S. insurance companies (data from the NAIC, 1990-2015)
- FinTech makes decentralized mutual risk sharing possible

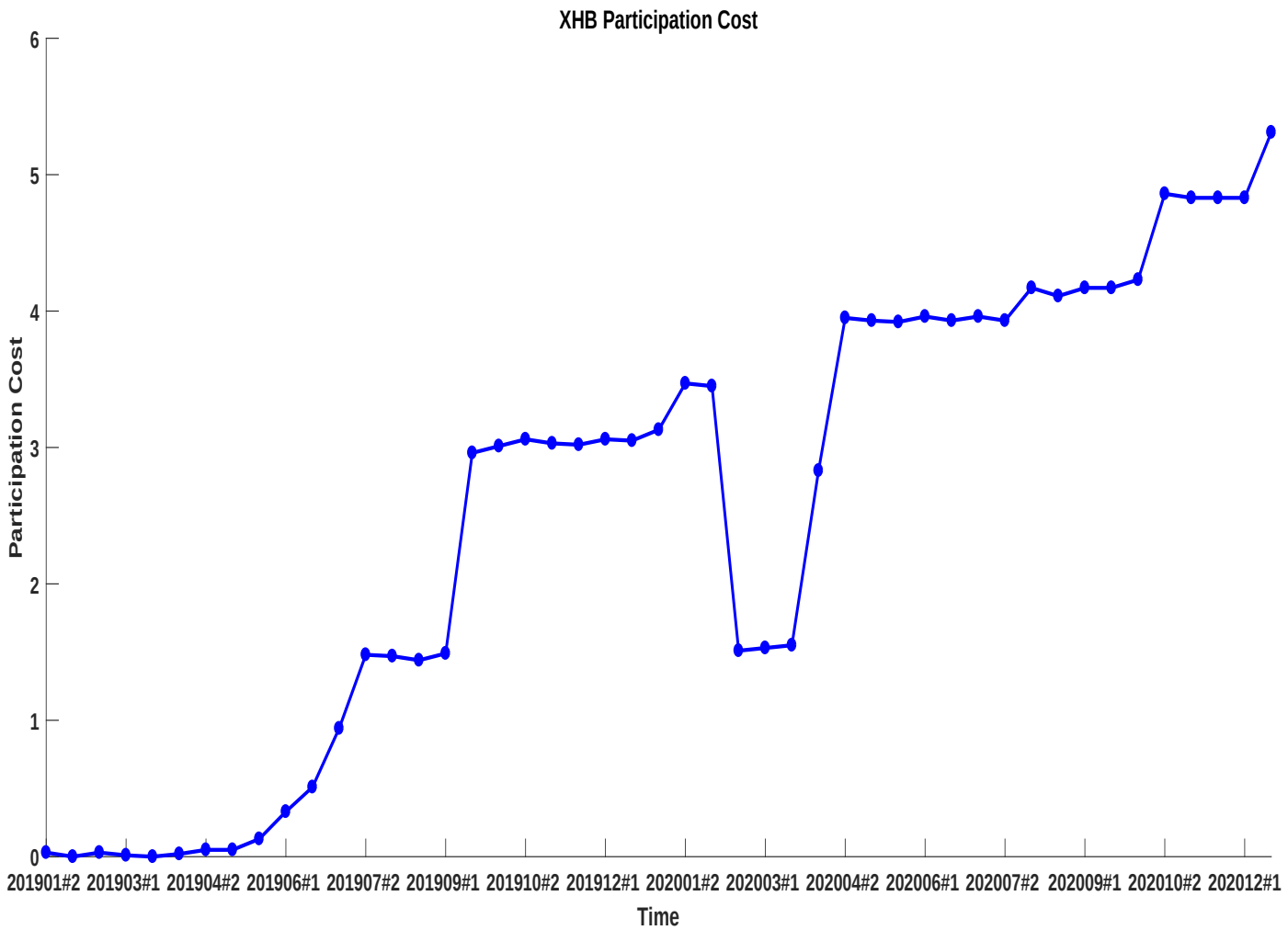
Mutual Risk Sharing and Fintech

- "Mutual aid" platforms: Emerging Fintech firms can use online platforms to reach traditionally un-insured customers and process business efficiently
- Xiang Hu Bao (*XHB*) is the largest so far
  - Launched in Oct 2018;
  - Provides critical illness indemnity to members who meet basic health and risk criteria
  - Spectacularly successful:
    - *XHB* had nearly 100 million members one year after its launch
    - $\approx$ total number of policyholders for the traditional critical illness insurance
- *XHB* stopped on January 28, 2022; 75 million members upon closure
  - Paid nearly CNY 20 billion to 200,000 participants from 2019/01 to 2022/01

XHB Aggregate Enrollment and Claim Payments



XHB Cost Per Member: Biweekly



Facts

- Fact 1: Much lower cost of *XHB*, compared to traditional critical illness insurance (CII)
  - On a biweekly basis, an ill member (below 40) receives \$53,000 by paying \$1
- Fact 2: Strikingly lower incidence rate of *XHB*, compared to traditional critical illness insurance (CII)
  - Its incidence rate is only 1/7 to 1/6 to that of traditional illness

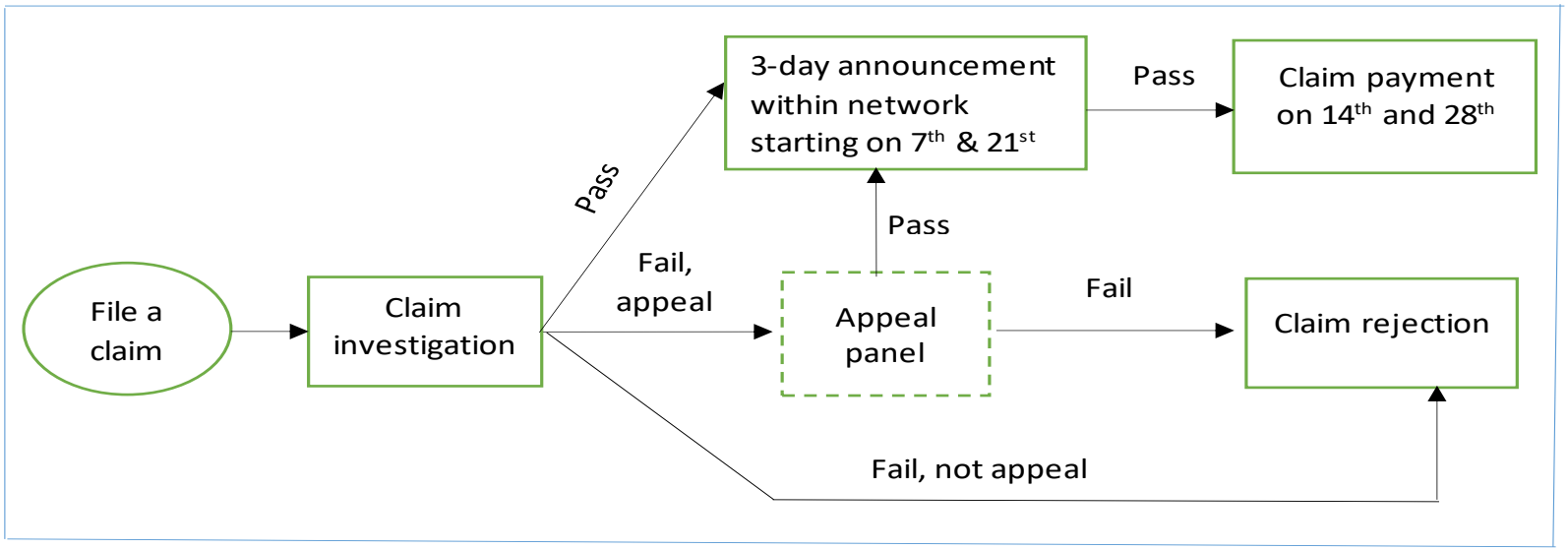
Institutional Details

Two *XHB* Plans

- Critical illness plan (*CIP*)
  - Member age: young and middle-aged participants between 30 days and 59 years old
  - Coverage: 100 critical illnesses + 5 rare illnesses
  - Indemnity levels
    - 0-39: CNY300,000
    - 40-59: CNY100,000
    - Reduced plans since Jun. 1, 2020
    - 0-39: CNY100,000 (Reduced)
    - 40-59: CNY50,000 (Reduced)
- Senior cancer plan (*SCP*)
  - Member age: senior participants from 60 to 70 years old
  - Coverage: critical malignant tumor only
  - Indemnity level: CNY100,000

Claim Process

Panel B: Claim Process



Fintech in *XHB*

- Apply artificial intelligence to process claims
  - Standardize claim procedure
  - Applying textual and graphic analysis in evaluating claim materials
  - Applying AI in task assignment
- Handled 200,000 claims in 2020, relative to PingAn: 50,000 claims; Taikang: 40,000 claims
- Crowd wisdom
  - Panel votes

XHB vs. Traditional Critical Illness Insurance (CII): Similarity

- Both provide fixed indemnity payments once the member (or policyholder) for covered critical illnesses.
- The set of covered critical illnesses are the same.

XHB vs. CII: Differences

- Fixed indemnity amount:
  - XHB: CNY300,000 for participants under 40 years of age, and CNY100,000 for participants aged between 40 and 59 for covered critical illness; The members do not have choices over the indemnity amount.
  - Most of the traditional CII plans have an indemnity level of CNY300,000, though policyholders have more flexible choices.
- Administrative cost:
  - XHB's 8% administrative cost charge is much lower than the typical 50% or higher administrative costs for CII products.
- Ex-ante vs. ex-post pricing:
  - XHB does not collect premiums *ex ante* from its members, instead equally allocates the aggregate indemnities payouts plus an 8% administrative fee among its active members at each claims payment period.

An Illustrative Model

Model

- Denote p_X as the average incidence rate of the covered critical illnesses for *XHB* members, k as the indemnity amount, λ_X as *XHB*'s loading factor (currently, 8%). Then, the per member cost sharing, denoted by π_X, as:

$$\pi_X = p_X k(1 + \lambda_X)$$

- Similarly, the premium for the traditional CII π_I with the same indemnity coverage k is:

$$\pi_I = p_I k(1 + \lambda_I)$$

where p_I is the average incidence rate and λ_I is the loading factor for traditional insurance.

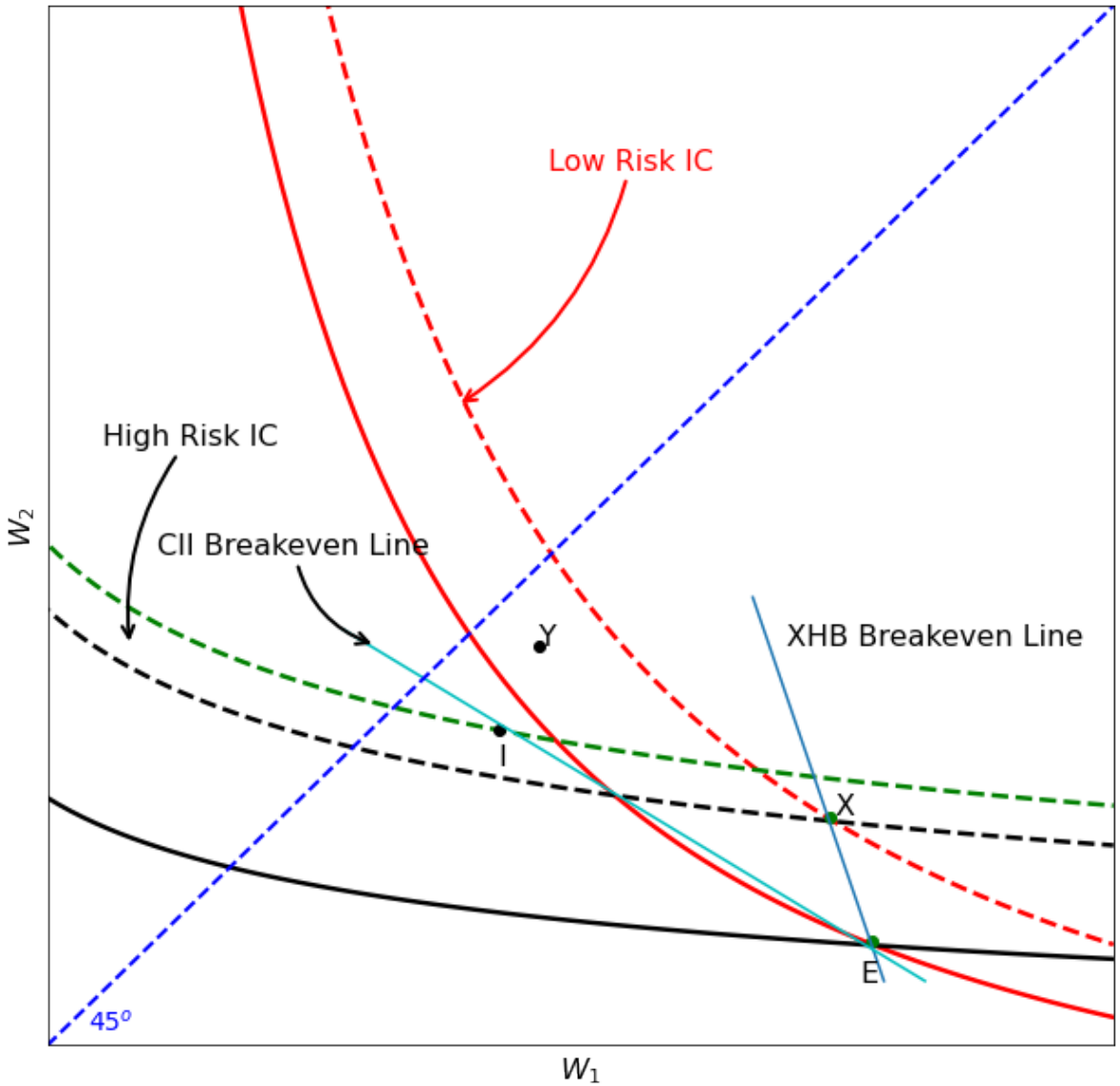
- $\Delta\pi = \pi_X - \pi_I$ can be decomposed as:

$$\Delta\pi = \underbrace{[p_X - p_I]k(1 + \lambda_X)}_{\text{IR difference}} + \underbrace{p_I K(\lambda_X - \lambda_I)}_{\text{Loading difference}}$$

Possible Channels

- Cost channel
  - Fintech lowers administrative costs: $\lambda_X < \lambda_I$: enrollment costs and claim processing
- Pricing channel
  - Ex-post loss sharing vs. ex-ante risk sharing
  - variable price versus "fixed" price
- Alipay users are healthier than the general population
  - Credit scores, incomes, mobile users, etc are sources of *advantageous selection*, at least in the short term
  - **Indemnity level restrictions can result in advantageous selection in XHB's competition against CII**

Rothschild-Stiglitz Framework: *MRS* vs. Insurance in State Space



Explanations and Interpretations

- W_1 is the state of no loss; W_1 is the state of having loss
- Holding risk aversion constant, the high risk individual selects I (insurance) while low-risk individual selects X (XHB)
- I offers more coverage than X
- Alternatively, holding risk constant, The interpretation holds
  - individuals differ in their risk attitudes

Individual Choices under Asymmetric Information

	Decision
Risk type	
High	
Low	

Individual Choices under Asymmetric Information

	Decision
Risk type	
High	buy insurance
Low	Do nothing

Individual Choices under Asymmetric Information

	Decision
Risk type	
High	buy insurance
Low	Buy XHB

Prediction 1

Choice between Mutual Aid versus Insurance: Separating Equilibrium

When individuals only differ in risk types, individuals with high risk (private information) choose I and individuals with low risk choose X when I offers more coverage than E.

Now let's introduce different risk attitude

	Decision	Decision
Risk type / Risk aversion	High	Low
High		
Low		

Now let's introduce different risk attitude

	Decision	Decision
Risk type / Risk aversion	High	Low
High	Insurance	
Low	Insurance	

Now let's introduce different risk attitude

	Decision	Decision
Risk type / Risk aversion	High	Low
High	Insurance	XHB
Low	Insurance	XHB

Key Prediction 2

Choice between mutual aid versus insurance when risks and risk attitudes are jointly considered

When risk and risk attitude are jointly considered, *XHB* may attract both low risk and less risk averse individuals.

Data Sets

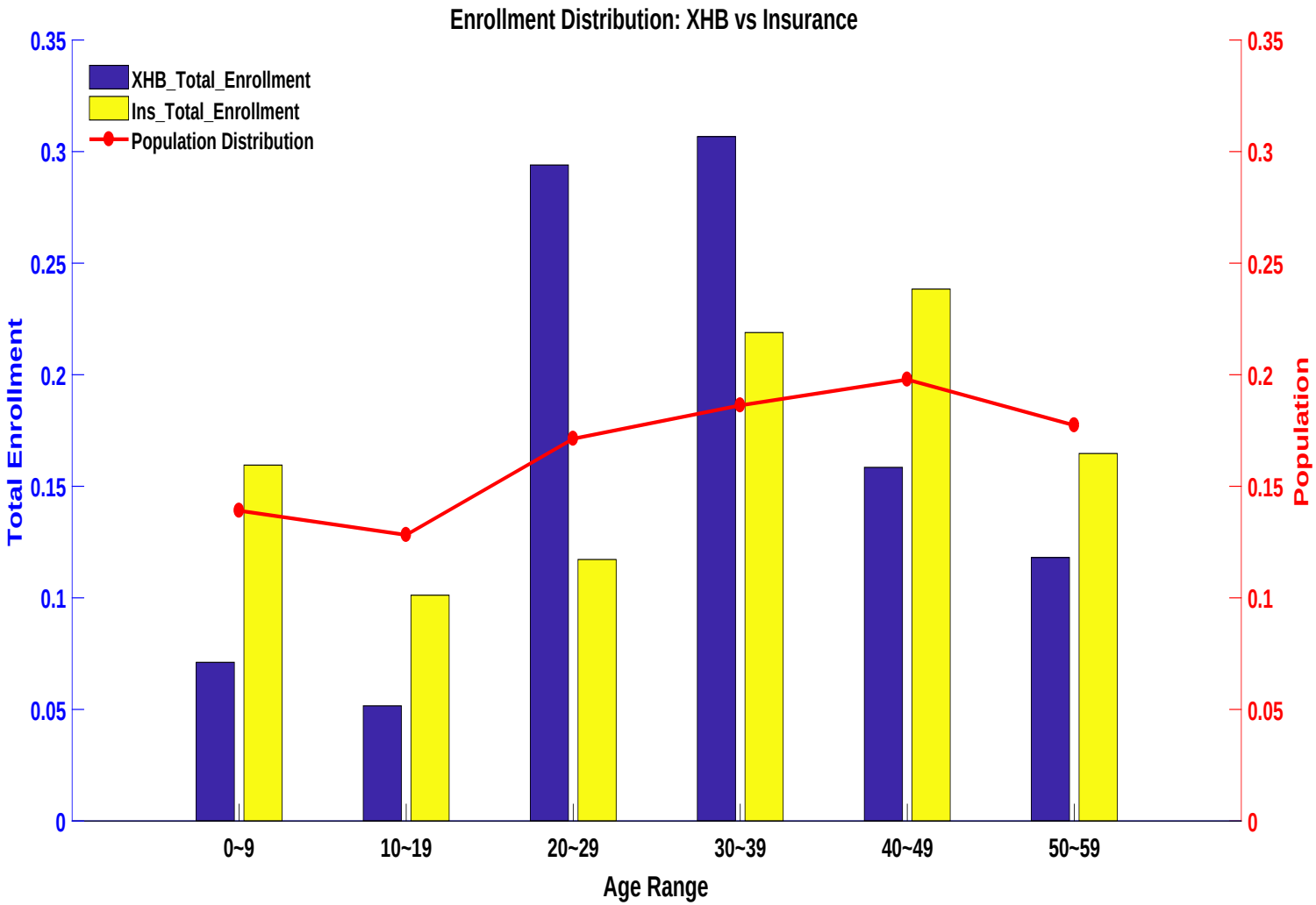
XHB Data Sets

- **Enrollment data:**
  - *XHB*'s total number of participants in each two-week period from January 2019 to June 2021.
  - For two periods (2020 January #1 and 2020 November #1): number of enrolled participants by six age groups: 0-9; 10-19; 20-29; 30-39; 40-49; and 50-59.
- **Claims Data:** Detailed information of each approved claim
  - Payment date, claimant's name, city of residence, age, gender;
  - Covered critical illness (including identifiers for mild critical illnesses), indemnity amount, and number of participants who share the costs.
- **Survey of online mutual aid products conducted by Ant Financial in 2019**: sample size 58,721

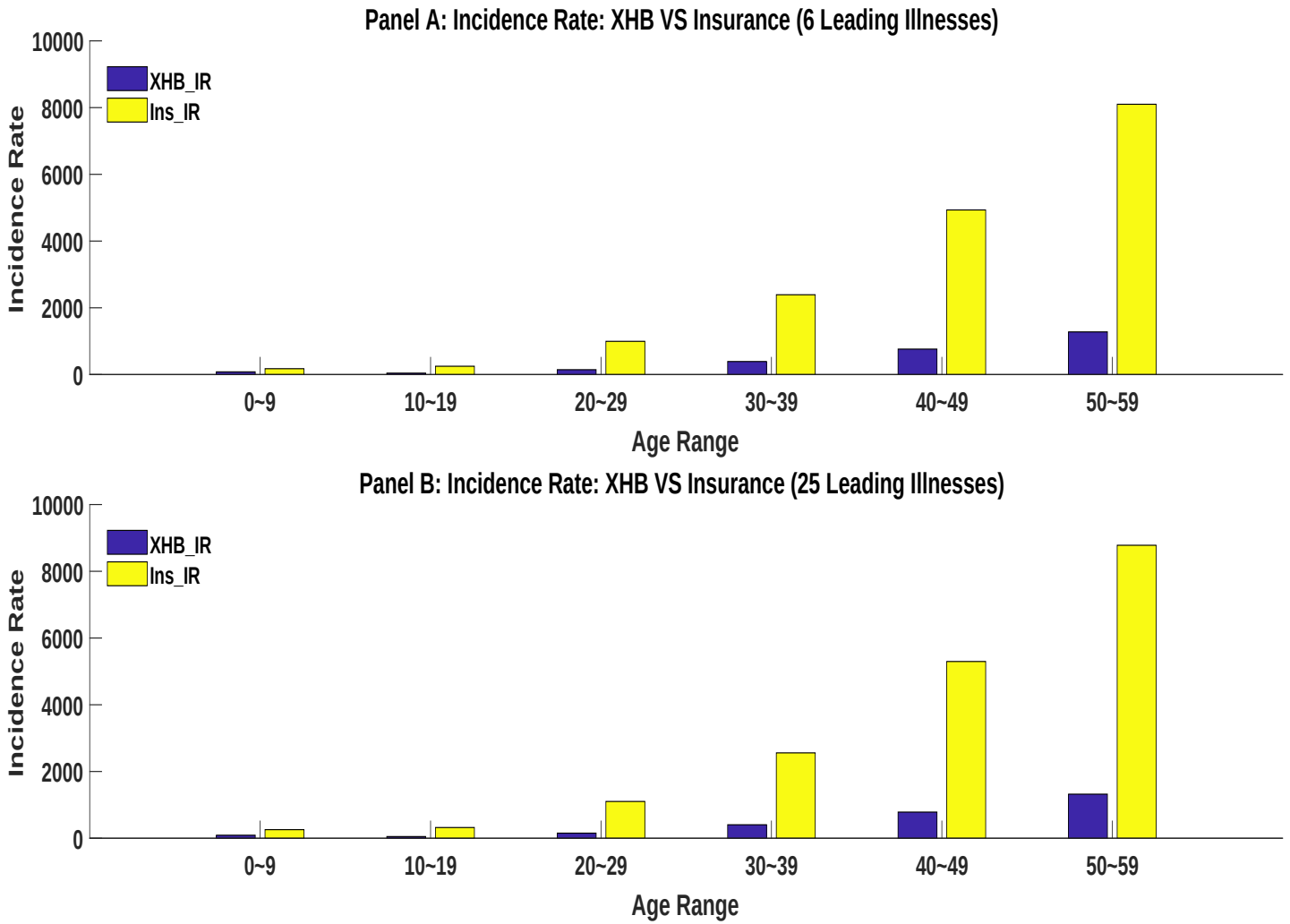
Critical Illness Insurance Participation and Incidence Rate Data

- Our data for participation and claims of CII come from the 2020 Historical Critical Illness Incidence Rate Table report published by the China Association of Actuaries (CAA).
- The table reports the incidence rates separately for, by age and by gender:
  - 6 leading critical illnesses;
  - 25 leading critical illnesses.
- Incidence rate is calculated based on the payouts of a group of most popular critical illness insurance policies:
  - Excludes the first year policies;
  - Only the first payment is included to construct the insurance incidence rate table (CII often allows multiple payments).
  - Thus comparable to the incidence rates observed for *XHB* members in concept.

Enrollment Distribution across Ages: *XHB* vs. CII



Incidence Rates across Ages: *XHB* vs. *CII*



Incidence Rates: *XHB* vs. *CII*

Group	# XHB (6-period lag)	# XHB Cases		IR^x (per million)		IR^i (per million)		IR Ratio CII/XHB	
		CI6	CI25	CI6	CI25	CI6	CI25	CI6 (t-stats)	CI25 (t-stats)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<10	6,686,520	23	25	81	91	173	254	2.46 (7.47)	3.19 (8.79)
10∼19	4,854,522	9	11	46	54	239	309	6.39 (8.80)	7.21 (7.84)
20∼29	27,647,050	153	162	133	141	1,024	1,132	8.51 (14.50)	8.80 (15.11)
30∼39	28,843,376	475	494	395	411	2,440	2,610	6.45 (17.34)	6.64 (17.38)
40∼49	14,904,129	477	492	768	793	4,910	5,272	6.80 (13.89)	7.07 (14.15)
50∼59	11,103,777	666	690	1,440	1,491	7,986	8,657	6.53 (10.33)	6.85 (10.41)
Total	94,039,375	1,804	1,875	460	478	3,192	3,459	7.34 (15.06)	7.66 (15.12)

Mutual Aid Survey Evidence

	(1) All ages	(2) $<$ 40 years	(3) $\geq$40 years
Age	-0.0001	0.01***	-0.01**
	(-0.06)	(6.81)	(-2.50)
Female	0.01	-0.004	0.06
	(0.39)	(-0.18)	(1.47)
Ins	-0.29***	-0.28***	-0.34***
	(-16.56)	(-14.07)	(-9.47)
CityTier	-0.01	-0.01***	0.03***
	(-1.02)	(-2.77)	(3.02)
Inc2	0.28***	0.30***	0.15***
	(14.40)	(13.26)	(3.68)
Inc3	0.37***	0.38***	0.21***
	(14.32)	(12.83)	(3.92)
Inc4	0.43***	0.46***	0.22**
	(9.27)	(8.47)	(2.38)
Inc5	0.24***	0.17	0.42**
	(2.67)	(1.63)	(2.22)

- Survey on Alipay account holders' participation in mutual aid programs
- Mutual aid members often do not have commercial critical illness insurance
- High incomers are more likely to be mutual aid program members

Survey Result: Subsequent Insurance Purchase

	(1) All ages	(2) $<$ 40 years	(3) $\geq$40 years
MA	0.34***	0.39***	0.17*
	(8.83)	(8.94)	(1.71)
AGE	-0.04***	-0.04***	-0.04***
	(-27.09)	(-13.24)	(-8.59)
FEMALE	0.37***	0.42***	0.22***
	(10.73)	(10.4)	(3.05)
TIER	-0.01	-0.02*	0.02
	(-1.17)	(-1.88)	(1.08)
INC2		0.26***	0.67***
		(6.9)	(9.87)
INC3		0.53***	0.86***
		(10.54)	(9.49)
INC4		0.75***	1.11***
		(7.69)	(7.1)
INC5		0.51***	1.33***
		(2.87)	(3.87)
SS	0.21***	0.21***	-0.11
	(4.92)	(4.47)	(-1.04)
INS	2.11***	1.89***	2.44***
	(58.53)	(45.32)	(31.24)

- Question: Would you plan to buy or continue to buy commercial health insurances in the future?

Survey Result: Subsequent Insurance Purchase

	$MA_t = 0$	$MA_t = 1$	Total
$INS_{t+1} = 0$	5,962	3,346	9,308
$INS_{t+1} = 1$	13,846	11,011	24,857
Total	19,808	14,537	34,165

$$Prob(INS_{t+1} = 1 | MA_t = 0) = \frac{13,846}{19,808} = 0.70$$

$$Prob(INS_{t+1} = 1 | MA_t = 1) = \frac{11,011}{14,357} = 0.77$$

Mutual aid participation appears to positively affect household commercial insurance consumption.

Conclusions

- Fintech makes mutual risk sharing possible
  - Pooling risk in a large pool
- Mutual risk sharing such XHB are different from traditional insurance;
  - Ex-post cost sharing
  - Low coverage
- More efficient risk sharing arrangement than traditional insurance.

Thank You!