Who Gains and Who Loses from Card Reward Programs?

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Overview

1. Payment methods

Means of Payment

(a) Commodity money (barter)

(b) Cash (notes and coins)

(c) Checks (hardly exists in Europe)

(d) E-cash (failed!)

(e) Bank transfers (Internet, ACH, IBAN) [popular in Europe, prohibitively expensive in the United States]

(f) **Payment cards** (debit, credit, other)

Overview

2. Types of card networks

Four-party systems

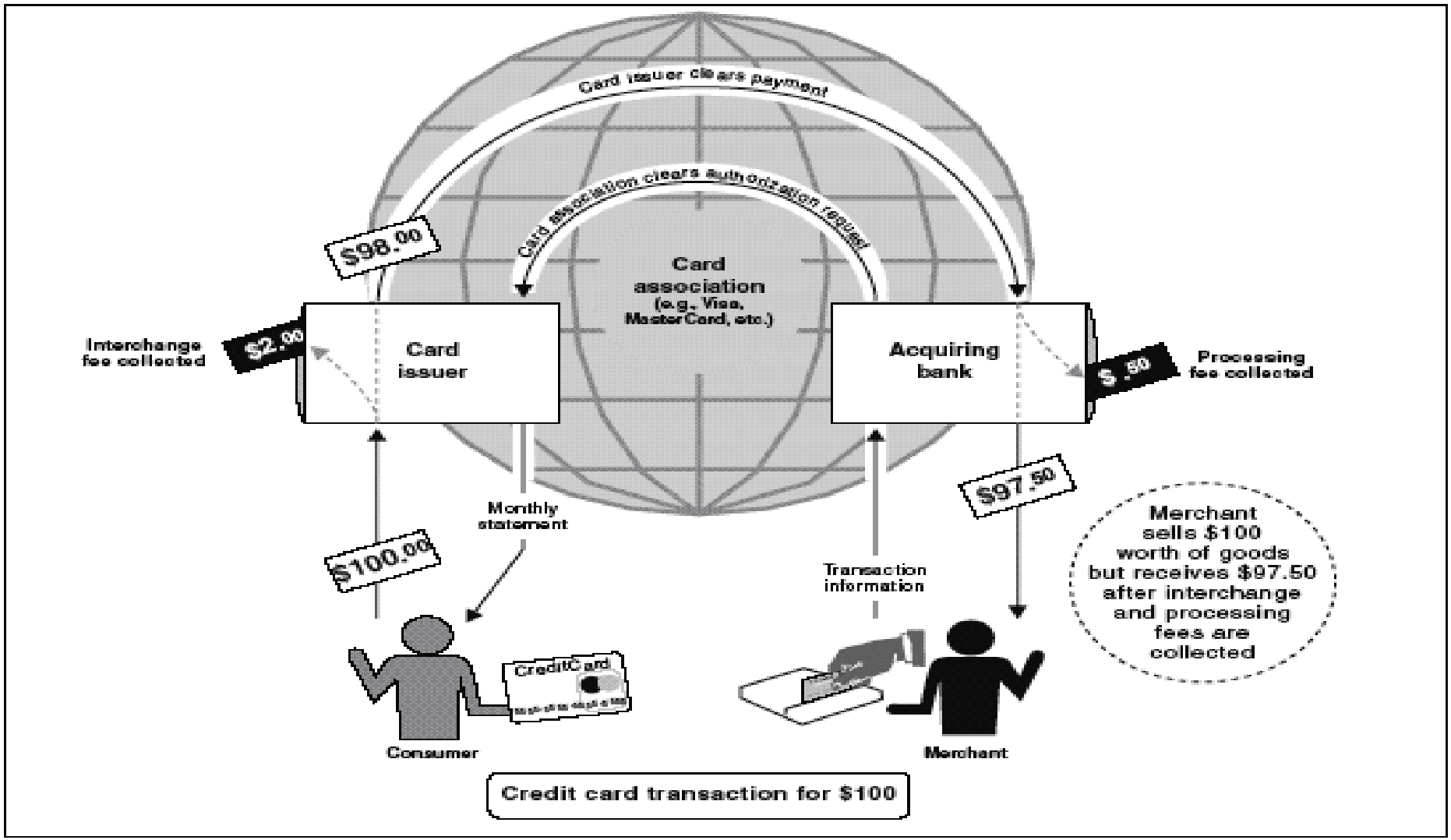
- Visa and MasterCard
- count for 80% of the US credit card markets
- Provide card services through member financial institutions
  - card-issuing banks
  - merchant-acquiring banks
- Four-party networks attracted the attention of antitrust authorities worldwide because card organizations coordinate (price fixing) the interchange fees (from acquiring banks to issuing banks)
- See Figure next slide

Three-party systems

- American Express (Amex) and Discover
- Handle card issuing and acquiring by themselves (hence, no IF fees)

Overview

3. Illustration of the four-party system



Four types of general purpose payment card in the United States

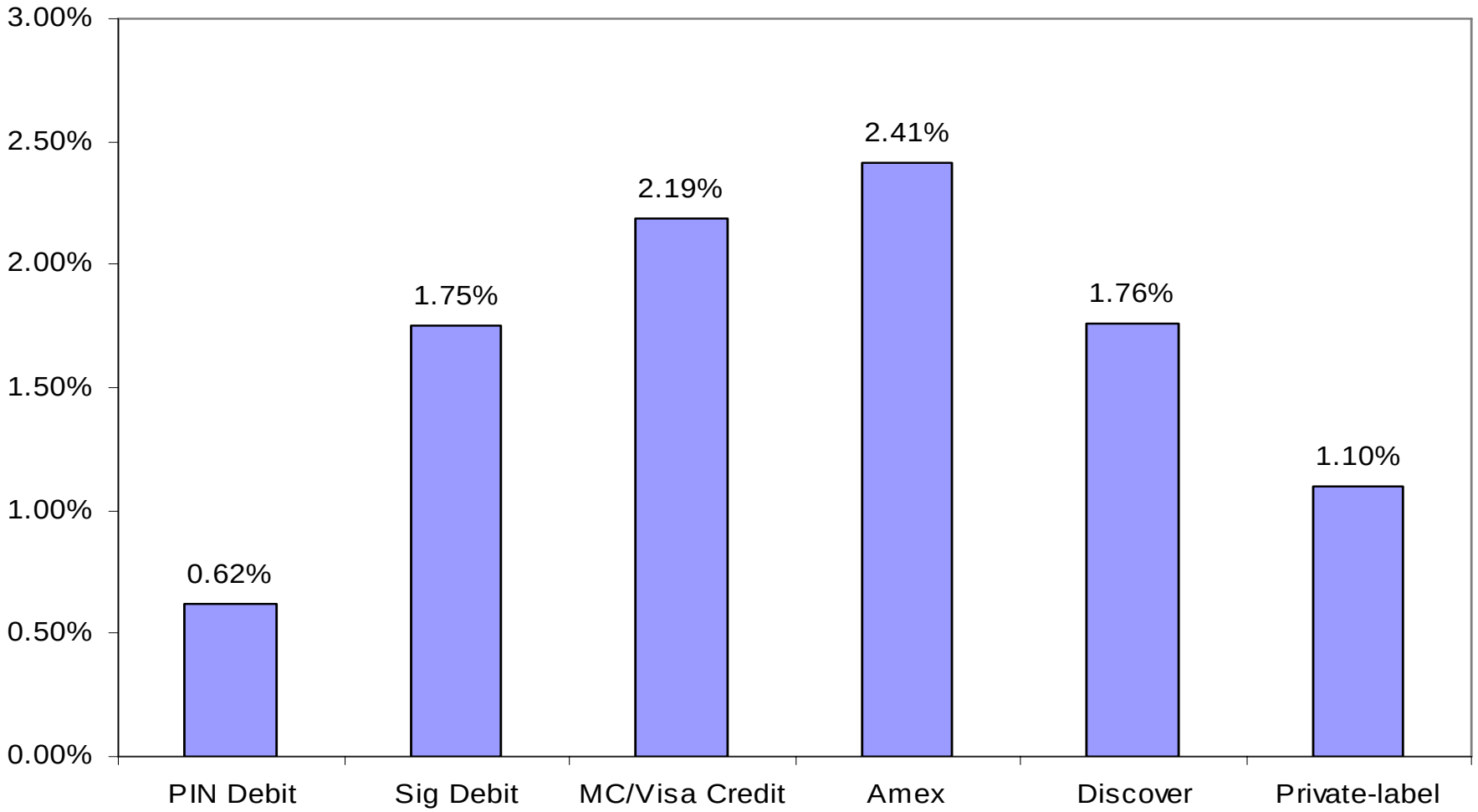
1. Credit cards (credit)
2. Charge cards (some credit, must be paid once a month)
3. Signature debit cards (provide no credit)
4. PIN debit cards (provide no credit)

Routing, clearing, and fees

- Card types 1–3 are routed over credit card networks generally charge fees proportional to transaction values
- PIN debit card transaction clear via EFT networks which uses the ACH network for check clearing

Data on Merchant Fees

Source: Hayashi, F. (2008), "Public Policy Implications on Payment Card Rewards Programs," Economic Review, Fourth Quarter, Federal Reserve Bank of Kansas City.



Overview

5. Debit cards with negligible fees

Question: Can a card network survive with "low" fees? Yes, for example:

- The German network of debit cards called *EC-Karten* operates without any interchange fees and a minimal merchant fee (about 10¢ per transaction)
- *EC-Karten* comes with any bank account (ATM card)
- A similar network (called PIN) operates in the Netherlands
- Under the PIN network, a merchant pays 8 Eurocents to the acquirer and 10 cents to relevant telecom company, so together merchants pay not more than 18 Eurocents per transaction

Overview

6. Debit cards with negligible fees

Merchants

- In recent years, merchants have become increasingly critical of the card fees, challenging both the fee structure and the level
- Since 2005, in the United States, there have been more than 50 antitrust court cases on interchange fees filed by merchants
- In Asia and Europe, court cases started a few years earlier.

Government

Recently, a bill (Credit Card Fair Fee Act 2008) was proposed to Congress represents an attempt to limit interchange and other card fees

Motivation for Writing This Paper

What this paper is *not* about

- Not about interchange fees (IF)
- It is about merchant fees
- Indeed, these fees are related because card acquirers roll over their IF on merchants (who then raise consumer prices)
- Does not analyze the gains from the entire card network suggested by the "two-sided market" theory

What this paper is about

(1) Provides a rigorous analysis of how merchant fees and buyer rewards affect retail prices and consumer welfare

(2) Relates our findings to consumers who represent different income levels

(3) Use data to calibrate for the percentage of buyers who are excluded as a result of the cards' reward program (merchant fees)

The Literature

I. Two-sided market and interchange fees

- The effects of merchant fees have been partially investigated in the literature on IF, see surveys by Chakravorti and Shah (*AB*, 2003), Schmalensee (*PCER*, 2003), Rochet (*RNE*, 2003), Armstrong (*RAND*, 2006), and Hayashi (FRB-KC, 2008).
- Due to the complexity involved with IF, authors avoided using downward sloping demand for the good buyers pay for, see Rochet & Tirole (*RAND*, 2002) and Wright (*EER*, 2003).
- Schwartz & Vincent (*RNE*, 2006) were the first to assume downward sloping demand. However, they also assumed constant populations of card and cash users.

The Literature

II. Merchant Resistance

- Puzzle: Payment cards are not legal tender. So why merchants accept cards when facing high merchant fees?
- Hayashi (2006, *RNE*) demonstrates the possibility of a "bad" equilibrium (for merchants) in which merchants accept cards, but both could be made better off if they accept cash only.
- Borzekowski and Kiser (2008, *IJIO*) present evidence showing that merchants can substantially reduce their cost by not accepting credit cards.

The Literature

III. Buyers who pay case "subsidize" card users

- This argument is known for a long time: Carlton and Frankel (ALJ, 1995), and Frankel (ALJ, 1998), Katz (Fed-KC, 2001)
- Gans and King (2003) have also analytically investigated the cross-subsidy argument (no downward sloping demand)
- Somewhat related: Chakravorti and Emmons (2003) explain why credit interest rates are so high. Interest is used to reward also those who pay on time and are not charged any interest.

Our (limited) Contribution

We provide a comprehensive analysis of buyers' welfare with

- Downward sloping demand for the good buyers pay for
- Endogenous determination of who pays cash and who pays with cards
- Analyze buyers who are heterogeneous w.r.t.
  (a) Valuation of good (product/service) they pay for
  (b) Gains from paying with a card over paying cash.

Why limited? Because we ignore the 2-sided market argument for these fees because

(1) The 2-sided market theory does not tell us which direction these fees should flow (from merchants to buyers or the other way around)

(2) We simply assume that the card market is mature in the sense that "many" buyers and merchants have already adopted the card [the 2-sided market theory does not apply to mature (saturated) markets]

The No-surcharge Rule (NSR)

I. Definition and observations

- Observation: Most merchants don't charge consumers extra for paying with a card
- Card associations don't allow it (declared illegal by some antitrust authorities)
- Even when allowed, most merchants don't surcharge (in the U.S. a few give cash discount)
- We assume the NSR (for whatever reason)

No-surcharge rule: Literature

- Evans and Schmalensee (Fed-KC, 2005): Many merchants still don't apply a surcharge on card payments or discounts for cash payments.
- Bolt, Jonker, and Van Renselaar (Bank of Netherlands, 2008) provide an empirical analysis of surcharging card payments and payment behavior in the Netherlands where surcharging is allowed.

The No-surcharge Rule (NSR)

II. The "puzzle"

Why don't merchants surcharge buyers for card payments even in countries where the NSR is illegal?

(1) Buyers' perception: Buyers are not aware of high merchant fees involved in card transactions. Buyers will suspect that merchants try to extract more money

(2) Price marking: State laws require marking the price on each item. This gets complicated especially if a sale is declared. So, marking products with various labels (according to the means of payments) seems impractical.

(3) Competition drives merchants not to impose a surcharge on card payments ["bad" equilibrium for merchants].

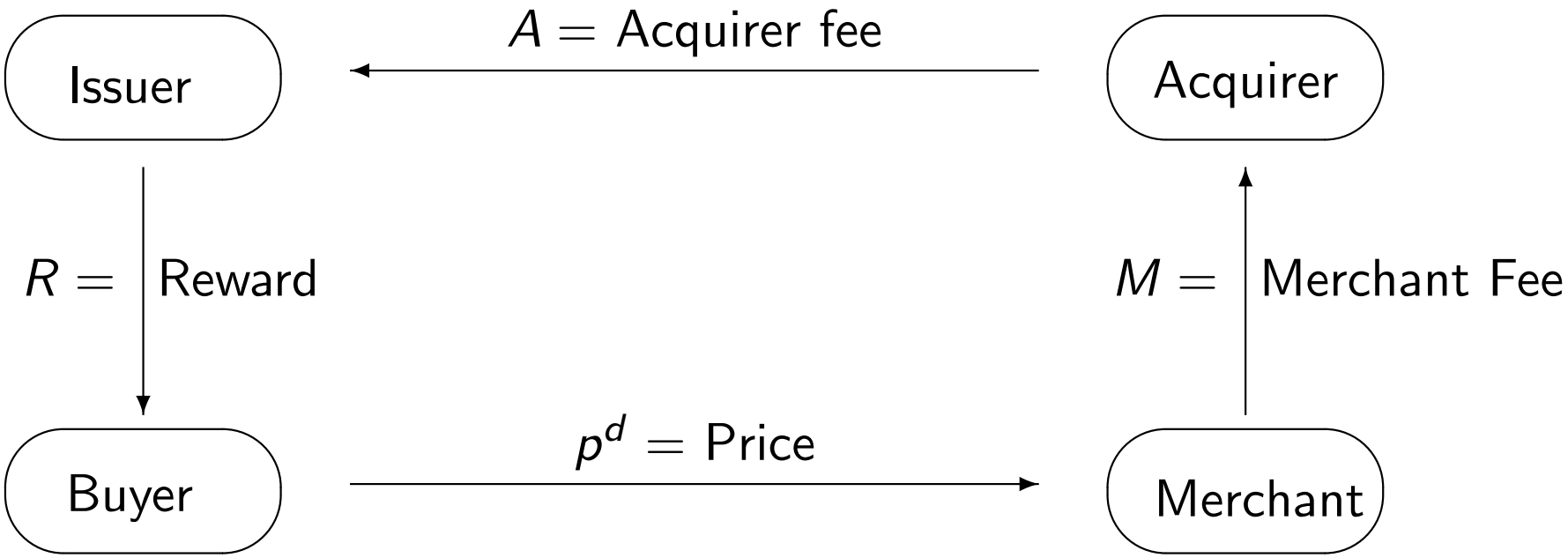
Data on Income and Card Use

2006 AARP survey data			2005/2006 Dove survey data		
Income	# Trans	Fraction	Income	# Trans	Fraction
<$15k	0.6	0.11	<$20k	5.3	0.13
$15–$25k	1.5	0.19	$20–$40k	6.6	0.15
$25–$35k	2.6	0.16	$40–$60k	8.2	0.21
$35–$50k	3.3	0.25	$60–$100k	9.5	0.28
$50–$75k	5.2	0.25	$100–$150k	13.0	0.37
$75–$100k	5.3	0.26	>$150k	15.7	0.48
>$100k	12.0	0.42			

Transactions are the monthly average number of credit card transactions. Fractions refer to the fraction of respondents using credit cards most frequently (over $50 for the AARP survey)

The Model

Fees in a simple card network



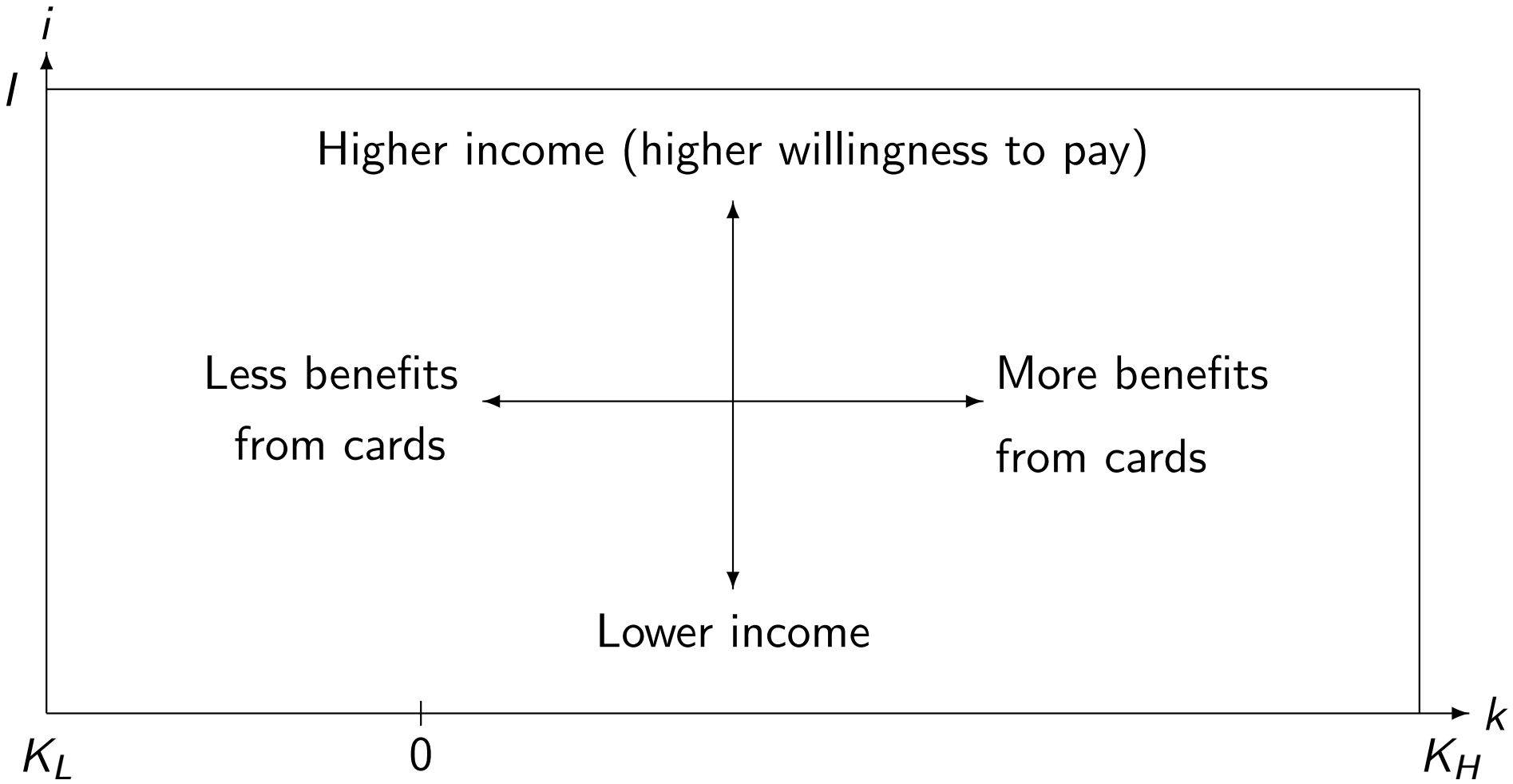
Assumption

Card issuers and card acquirers don't make above-normal profits.
Formally, $R = M = A$.

The Model

Buyers

Heterogeneous consumers indexed by $(k, i) \in [K_L, K_H] \times [0, I]$



The Model

Buyers con'd

$$u_{k,i} \stackrel{\text{def}}{=} \begin{cases} i - p^h & \text{Buys and pays cash (only cash accepted)} \\ i - p^d & \text{Buys and pays cash (cash and cards are accepted)} \\ i + k - p^d + R & \text{Buys pays with a card (cash and cards accepted)} \\ 0 & \text{Does not buy.} \end{cases}$$

Remark: Buyers indexed by $k < 0$ prefer paying cash over cards (if there are no rewards, $R = 0$). The reward R can offset this disutility.

The Model

Merchants: Costs and profit

- C = unit production cost (product/service)
- M = Merchant fee
- C = total merchant's cost of one cash transaction,
- $C + M$ = total merchant's cost of a card transaction
- $\pi^h = (p^h - C)q^h$ = total profit if only cash is accepted
- $\pi^d = (p^d - C)q^h + (p^d - C - M)q^d$ = total profit if both accepted
- Analyze 3 configurations:

  Marginal-cost pricing Merchants: No reservation utility, fully-served market

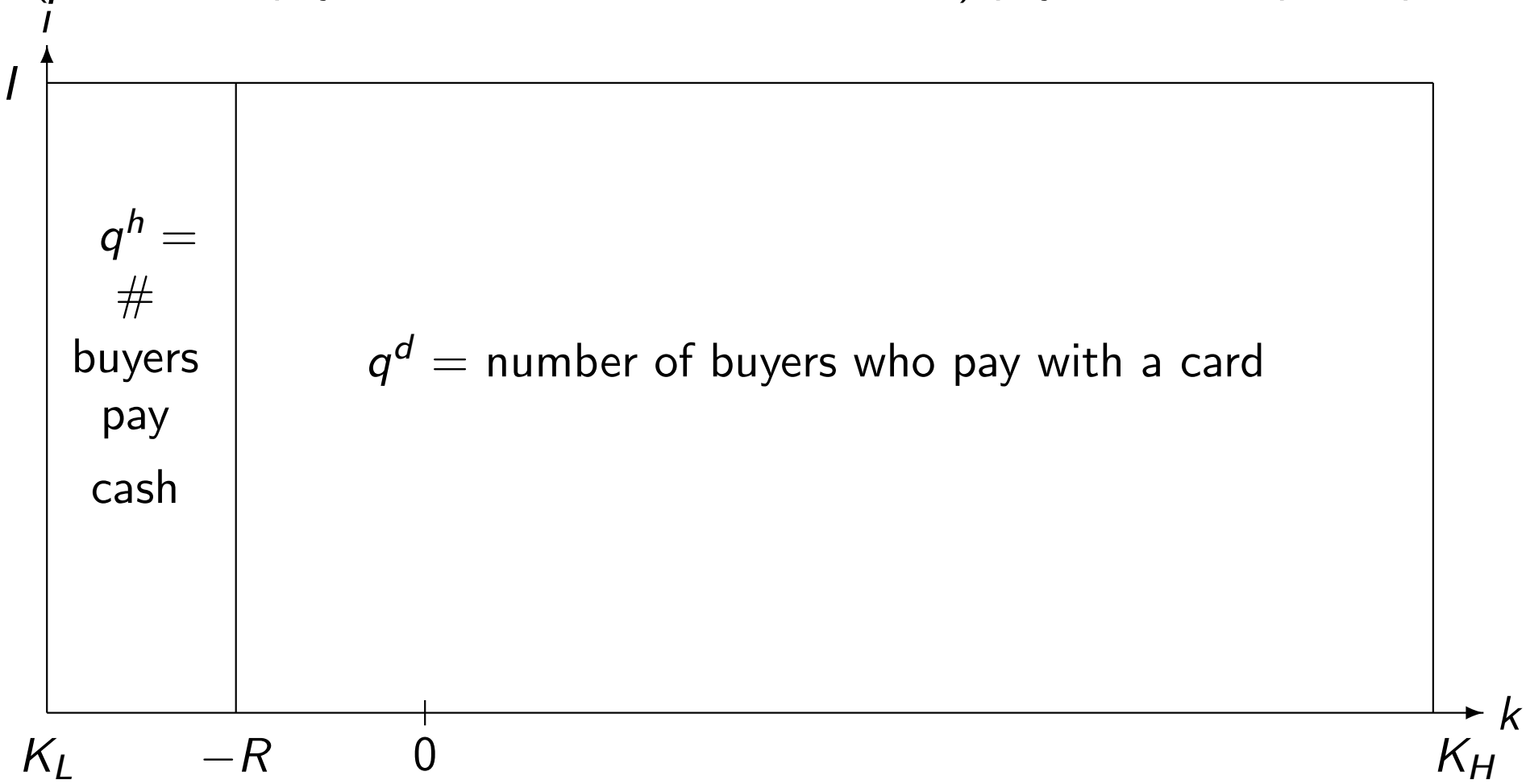
  Marginal-cost pricing Merchants: Reservation utility, partially-served market

  Monopoly Merchant: Reservation utility, partially-served market

Marginal-cost Pricing Merchant: Fully-served Market

Merchant accepts cash and cards: Equilibrium

Marginal-cost pricing: $p^d = C + M = C + R$. By the NSR, All buyers (those who pay cash and those who use cards) pay the same price, p^d



Marginal-cost Pricing Merchant: Fully-served Market

Merchant accepts cash and cards: Buyers' welfare

Welfare of buyers who pay cash

$$cw_d^h = (-R - K_L) \int_0^I (i - p^d) di$$

Welfare of buyers who pay with cards

$$cw_d^d = \int_{-R}^{K_H} \int_0^I (i + k - p^d + R) di\, dk$$

Now, analyze how these vary with the reward/merchant fee $R = M$

$$\left.\frac{dcw_d^h}{dR}\right|_{R=0} < 0, \quad \left.\frac{dcw_d^d}{dR}\right|_{R=0} > 0, \quad \left.\frac{dcw_d}{dR}\right|_{R=0} = \left.\frac{dcw_d^h + cw_d^d}{dR}\right|_{R=0} < 0$$

Marginal-cost Pricing Merchant: Fully-served Market

Merchant accepts cash and cards: Buyers' welfare: Results

Result 1

Instituting a reward program which equals to the merchant fee, $R = M$, will

(a) increase the welfare of buyers who pay with a card,

(b) decrease the welfare of buyers who pay cash, and

(c) reduce aggregate consumer welfare.

One way of interpreting the above result is as follows.

Result 2

Reward programs act as a subsidy from a cash users to card users.

Marginal-cost Pricing Merchant: Fully-served Market

Merchant accepts cash only

Marginal-cost pricing: $p^d = C$. All buyers pay cash.

Welfare of buyers

$$cw_h = (K_H - K_L) \int_0^I (i - p^d) di = \frac{I(I-2c)(K_H-K_L)}{2}$$

Buyers' aggregate gain from the card system

$$cw_d - cw_h = \frac{I(K_H^2+2K_L R+R^2)}{2} > 0$$

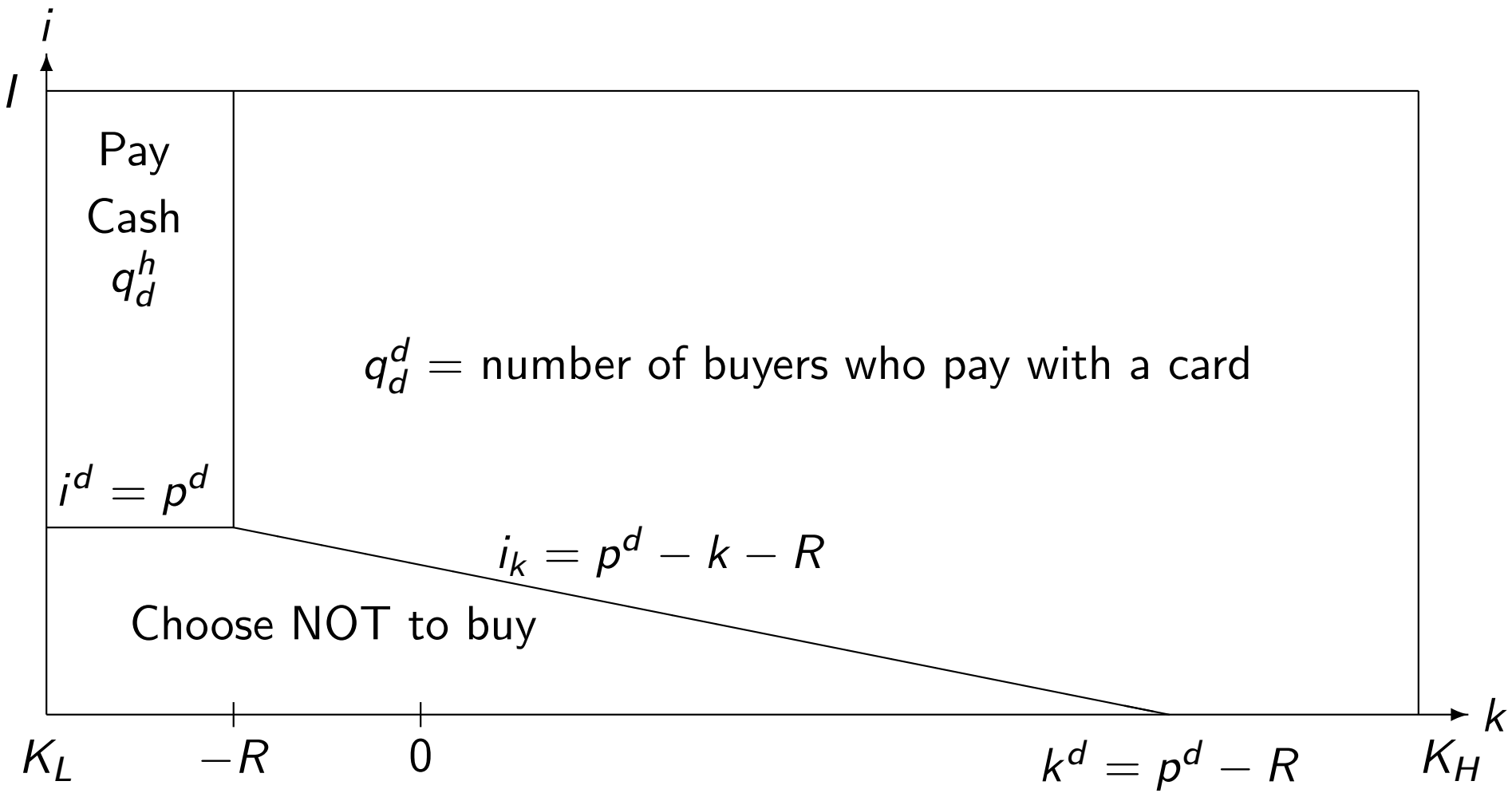
Result 3

The availability of cards is beneficial to buyers.

Why this result 3 is important? For a meaningful welfare evaluation of the card network, it is important to model an environment where cards are useful!

Marginal-cost Pricing Merchant: Partially-served Market

Merchant accepts cash and cards: Equilibrium



Marginal-cost Pricing Merchant: Partially-served Market

Merchant accepts cash and cards: Welfare results (same as under fully-served market)

How buyers' welfare vary with the reward/merchant fee $R = M$

$$\left.\frac{dcw_d^h}{dR}\right|_{R=0} < 0, \quad \left.\frac{dcw_d^d}{dR}\right|_{R=0} > 0, \quad \left.\frac{dcw_d}{dR}\right|_{R=0} = \left.\frac{dcw_d^h + cw_d^d}{dR}\right|_{R=0} < 0$$

Result 1'

Instituting a reward program which equals to the merchant fee, $R = M$, will

(a) increase the welfare of buyers who pay with a card,

(b) decrease the welfare of buyers who pay cash, and

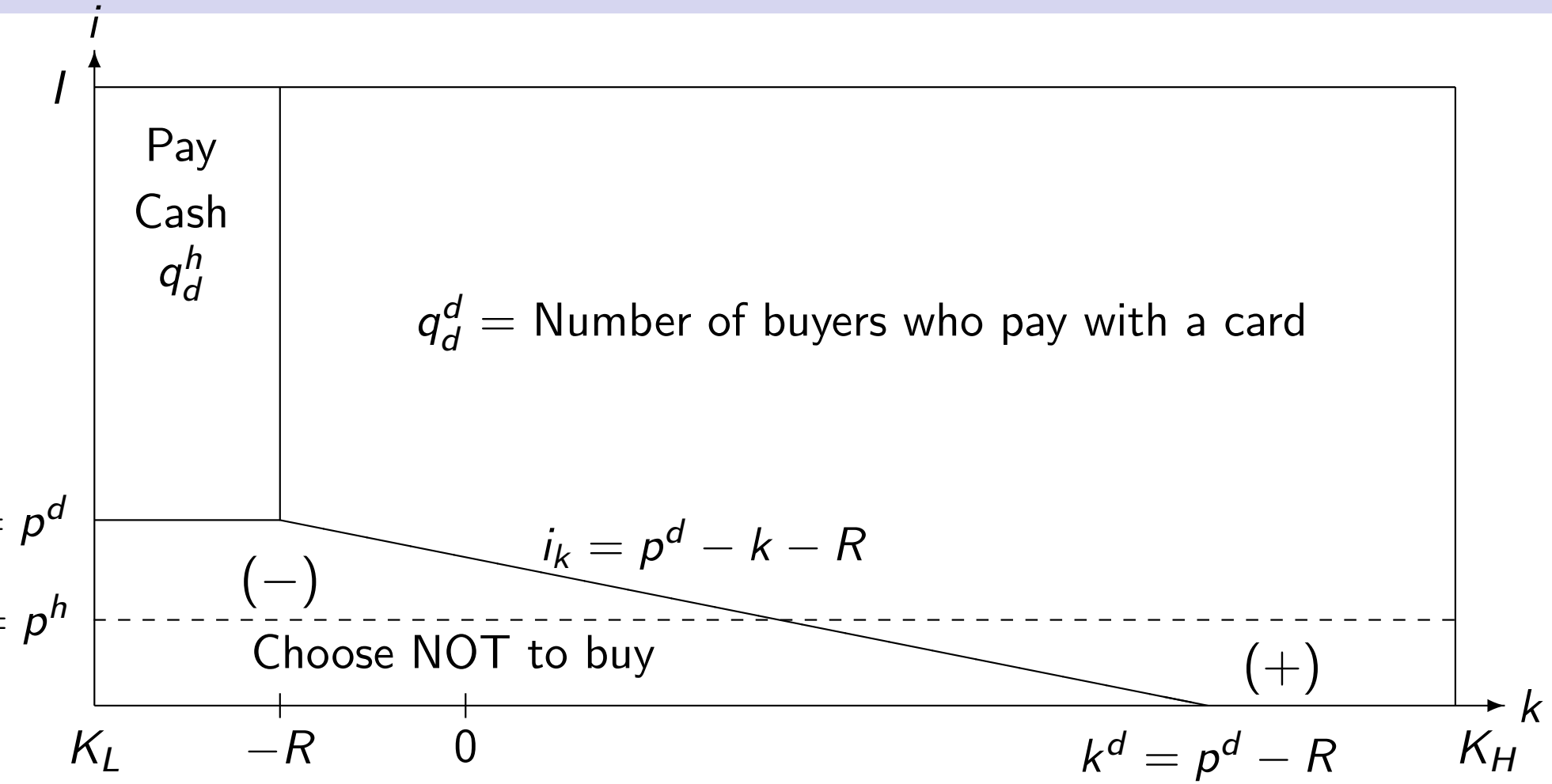
(c) reduce aggregate consumer welfare.

Result 2'

Reward programs act as a subsidy from a cash users to card users.

Marginal-cost Pricing Merchant: Partially-served Market

Merchant accepts cash only: Equilibrium (dashed line) vs. cards and cash (solid)



(−) low-income consumers who opt out when cards are accepted.

(+) low-income consumers who buy only if cards are acceptable.

Marginal-cost Pricing Merchant: Partially-served Market

Merchant accepts cash only versus cards and cash

Result 4

There exists a threshold reward $\bar{R}$ below which there are more buyers when only cash is accepted. Formally, $q_h \geq q_d$ if and only if $R \leq \bar{R} \stackrel{\text{def}}{=} -K_L + \sqrt{K_L^2 + C^2 - 2K_H C}$.

The above condition is hard to interpret. So set $C = 0$ (low-cost purchase). Then,

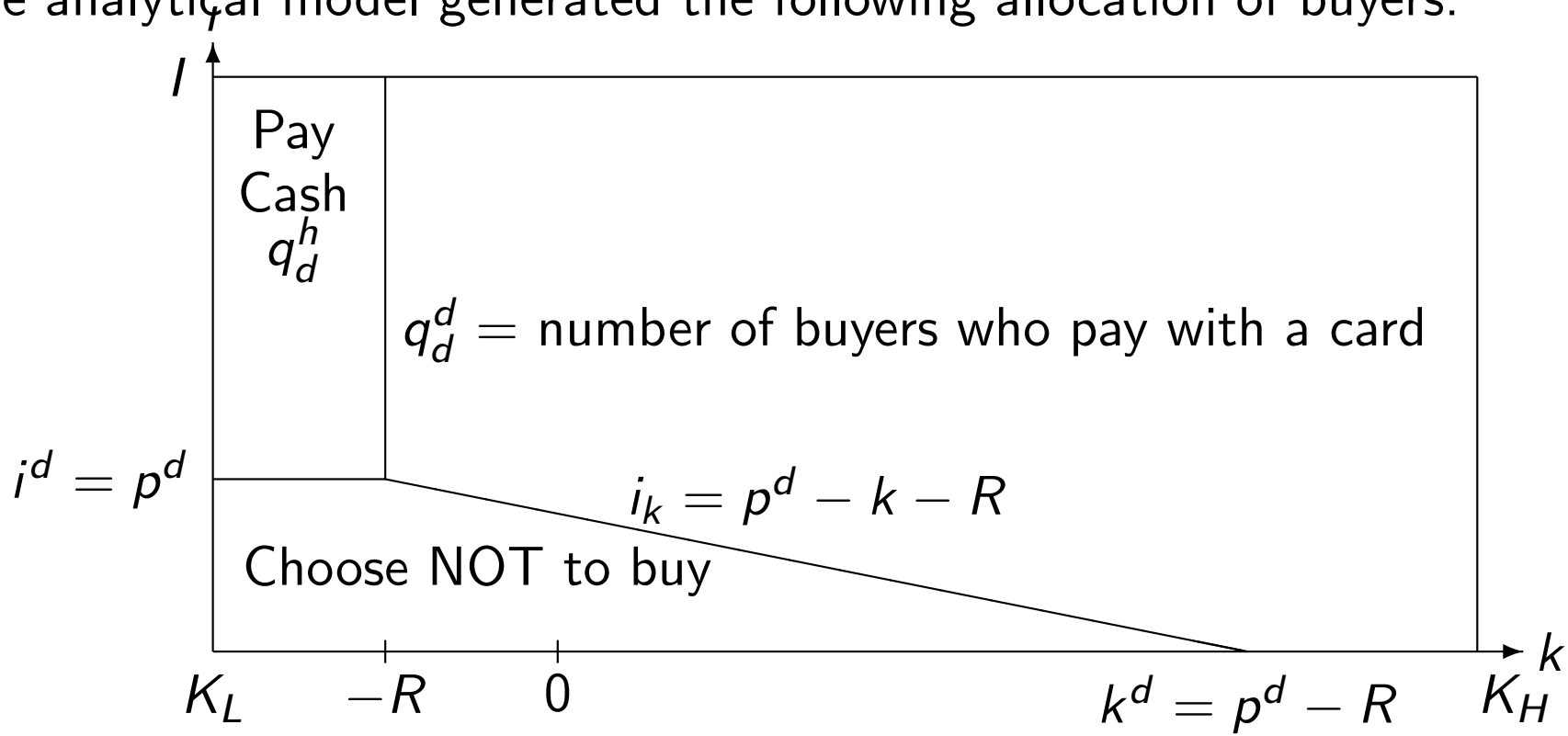
Result 5

For low-cost purchases under which some buyers pay cash and some pay with a card, more low-income consumers are excluded when cards and cash are accepted compared to the equilibrium when only cash is accepted.

Calibrations for the Percentage of Excluded Consumers

Using the analytical model and real data to obtain estimates

The analytical model generated the following allocation of buyers:



In order to calibrate for the *percentage* of excluded buyers, we normalize the number of potential buyers to one. Formally, set $I = 1$ (income is now between 0 and 1), and $K_H - K_L = 1$

Calibrations for the Percentage of Excluded Consumers

Results

Suppose merchants set prices equal to marginal cost (merchant fee inclusive). Suppose that rewards to buyers are rolled over the merchants $R = M$. Then,

An increase of 1% in the reward on card payments will

(a) decrease the percentage of cash payers by 0.13%–0.39%,

(b) increase the percentage of card users by 0.09%–0.25%, and

(c) decrease the percentage of buyers (increase the percentage of excluded consumers) by 0.04%–0.15%.

Monopoly Merchant

Why the monopoly case is interesting?

- Under competition, merchants set $p^h = C$ if cards are *not* accepted
- and $p^d = C + M = C + R$ if cards (and cash) are accepted
- Monopoly is free to set $p^h > C$ and $p^d > C + M = C + R$
- Why the monopoly case is interesting?
  Because a monopoly merchant can potentially absorb part of the increase in merchant fee, M

Monopoly solves: $\max_{p^d} \pi^d = (p^d - C)q_d^h + (p^d - C - R)q_d^d$
Define "merchant fee pass-through" by

$$\phi(R) = \frac{p^d(R) - p^d(0)}{R}$$

Interpretation: The fraction of merchant fee which is embedded into the retail price

Monopoly Merchant

Pass-through numerical simulations: Effects of K_L and R

R	0.05	0.10	0.15	0.20	0.25
K_L	ϕ as function of R and K_L $(C = 0)$				
0.0	103.1%	106.1%	109.1%	exl'd	exl'd
−0.1	95.1%	98.1%	101.0%	exl'd	exl'd
−0.2	88.0%	90.7%	93.5%	96.3%	exl'd
−0.3	81.5%	84.1%	86.7%	89.4%	92.0%
−0.4	75.7%	78.1%	80.6%	83.1%	85.6%
−0.5	70.5%	72.8%	75.0%	77.4%	79.7%

Result 6

An increase in the number of buyers who prefer to pay cash over cards, reduces the fraction of the merchant fee passed on to the buyers in the form of a higher retail price.

Monopoly Merchant

Pass-through numerical simulations: Effects of C and R

R	0.05	0.10	0.15	0.20	0.25
C	ϕ as function of R and C ($K_L = -0.5$)				
0.0	70.5%	72.8%	75.0%	77.4%	79.7%
0.1	70.7%	72.9%	75.2%	77.5%	79.9%
0.2	70.9%	73.1%	75.4%	77.7%	exl'd
0.3	71.1%	73.3%	75.5%	77.8%	exl'd
0.4	71.3%	73.5%	75.7%	exl'd	exl'd
0.5	71.6%	exl'd	exl'd	exl'd	exl'd

Result 7

If the good costs more to produce, the merchant embeds a larger the fraction of the merchant fee into the price. Formally, $\phi(R, C)$ increases with C.

Monopoly Merchant

Pass-through numerical simulations: General results

Result 8

The higher the fee imposed on the merchant, the larger is the fraction of this fee which is rolled over on the buyers in the form of a higher price. Formally, $\phi(R)$ increases with R.

And... last-but-not-least... a really surprising result

Result 9

If there are fewer buyers who prefer cash over cards, and/or for sufficiently-high merchant fees, the monopoly merchant increases the price by more than the merchant fee compared to the price the monopoly sets when the merchant fee and the rewards are set to zero. Formally, $\phi(R) > 1$ for sufficiently high levels of K_L and R.

The literature claims that a monopoly generally absorbs part of the fee. Here we demonstrate some opposite cases (harm non-card buyers)