

The Dynamics of Retail Payment Markets and Consumer Adoption of Payment Instruments

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Bank of Finland Simulator Seminar
August 2024

How to design retail payment infrastructure ?

Future of Money

Swiss launch instant payments to catch up with Europe

By John Revill

August 21, 2024 10:42 AM GMT+2 · Updated a day ago



Summary Companies

- Instant payment option covers 95% of Swiss retail transactions
- Swiss play catch-up with Europe's more advanced instant payments
- Instant payments reduce settlement risk, could boost business
- Swiss remain attached to physical cash payments survey shows

ZURICH, Aug 21 (Reuters) - Swiss companies and consumers are now able to make instant electronic payments, catching up with other European financial centres where the ultra-fast transfers are increasingly popular.

Instant payments allow credit transfers within 10 seconds of a payment being made rather than waiting for days for the transaction to clear. They have been in use in Europe since 2017 and in the U.S. since last year.

How to regulate / design payment instruments ?



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Competition Commission

COMCO obtains low interchange fees for Mastercard debit cards

Bern, 16.05.2024 - Payments with debit cards are charged with fees, such as the interchange fee. COMCO settles with Mastercard on an interchange fee of 0,12 % for domestic card-present transactions.



Edgenössische Finanzmarktaufsicht FINMA
Autorité fédérale de surveillance des marchés financiers FINMA
Autorità federale di vigilanza sui mercati finanziari FINMA
Swiss Financial Market Supervisory Authority FINMA

FINMA Guidance 06/2024

Stablecoins: risks and challenges for issuers of stablecoins and banks providing guarantees

26 July 2024



Why do we need a digital euro?

The way people pay is changing rapidly and consumers in the euro area increasingly prefer to pay electronically rather than with cash.

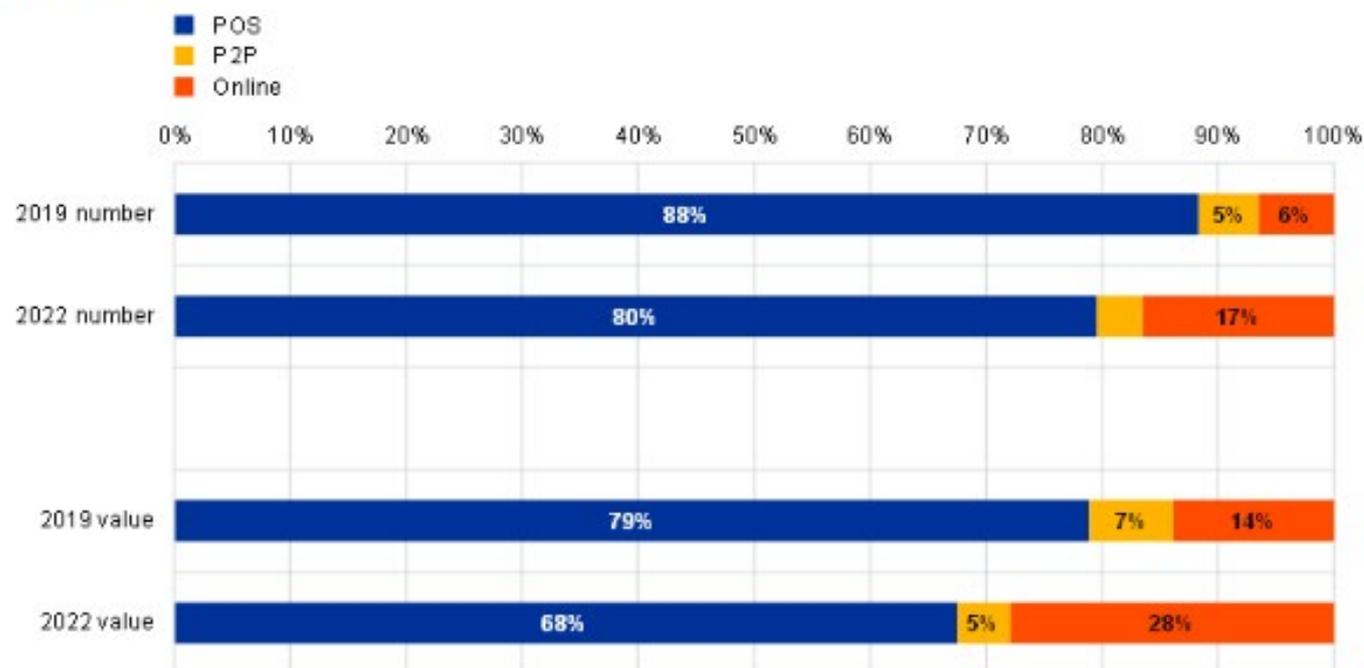
This is why, in order to safeguard the role of public money and maintain trust in our currency, we're exploring the benefits of a safe and universally accepted digital euro.

Trend 1: Offline -> Online

Chart 1

Number and value of non-recurring payments by payment situation, 2019 – 2022, euro area

(percentages)



Sources: ECB, calculations based on De Nederlandsche Bank and the Dutch Payments Association (2020, 2022) and Deutsche Bundesbank (2018, 2022).

Note: Percentages may not add up to 100% due to rounding.

Source: ECB SPACE 2022

Trend 2: Cash -> Card -> Mobile

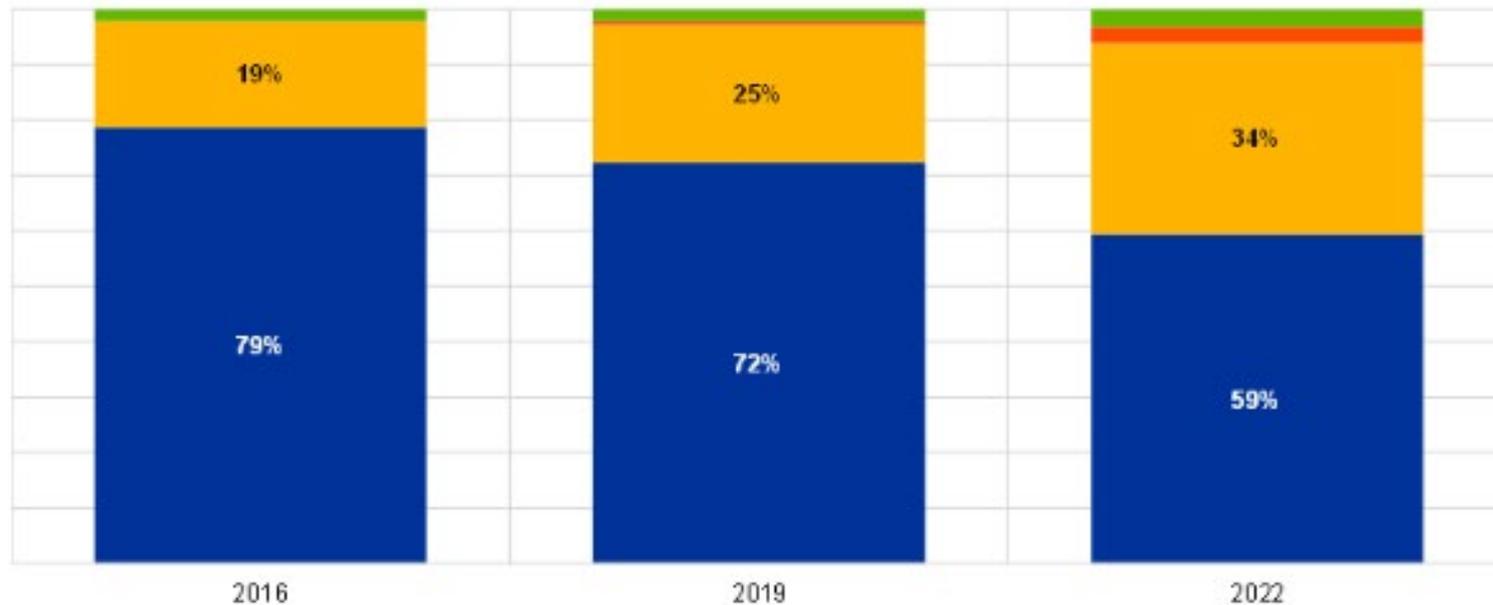
Chart 2

Share of payment instruments used at the POS in terms of number and value of transactions, 2016-2022, euro area

(percentages)

Number of transactions

- Cash
- Cards
- Mobile app
- Other



Source: ECB SPACE 2022

Heterogeneity: Payment channels

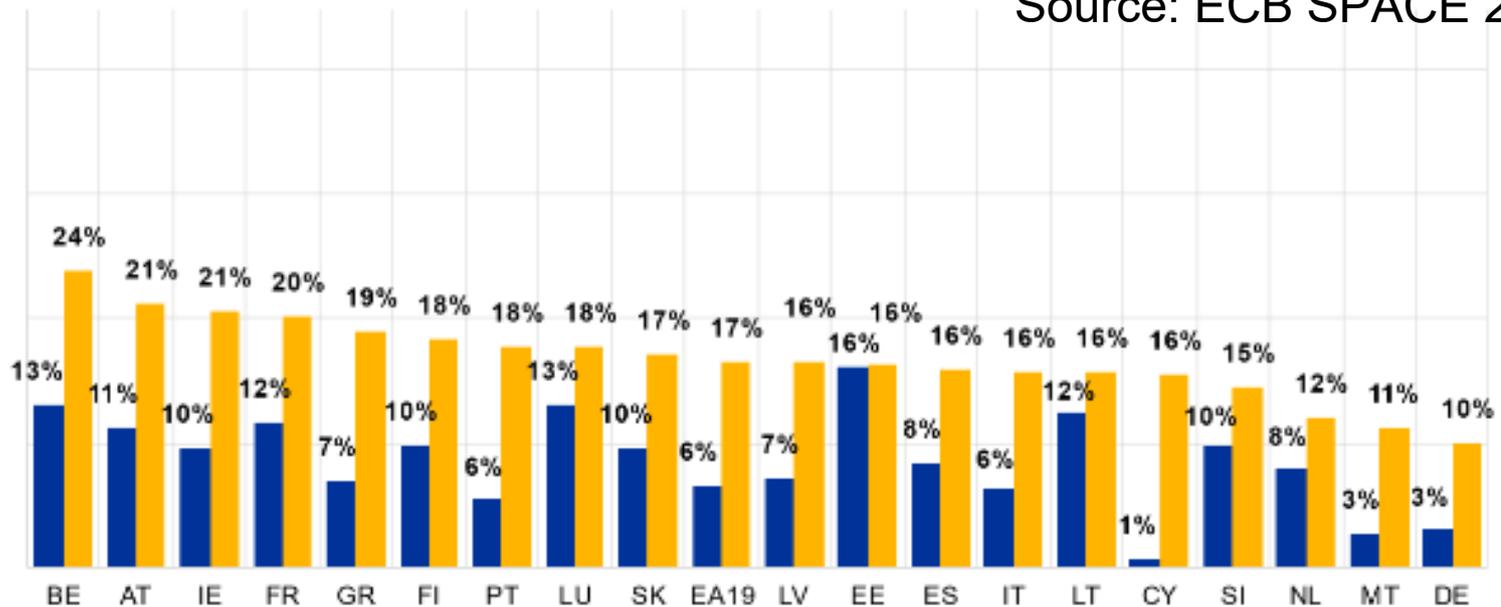
Chart 3

Share of online payments in consumers' non-recurring transactions in terms of number and value of transactions, 2019-2022, by country

(percentages)

Number of payments

■ 2019
■ 2022



Source: ECB SPACE 2022

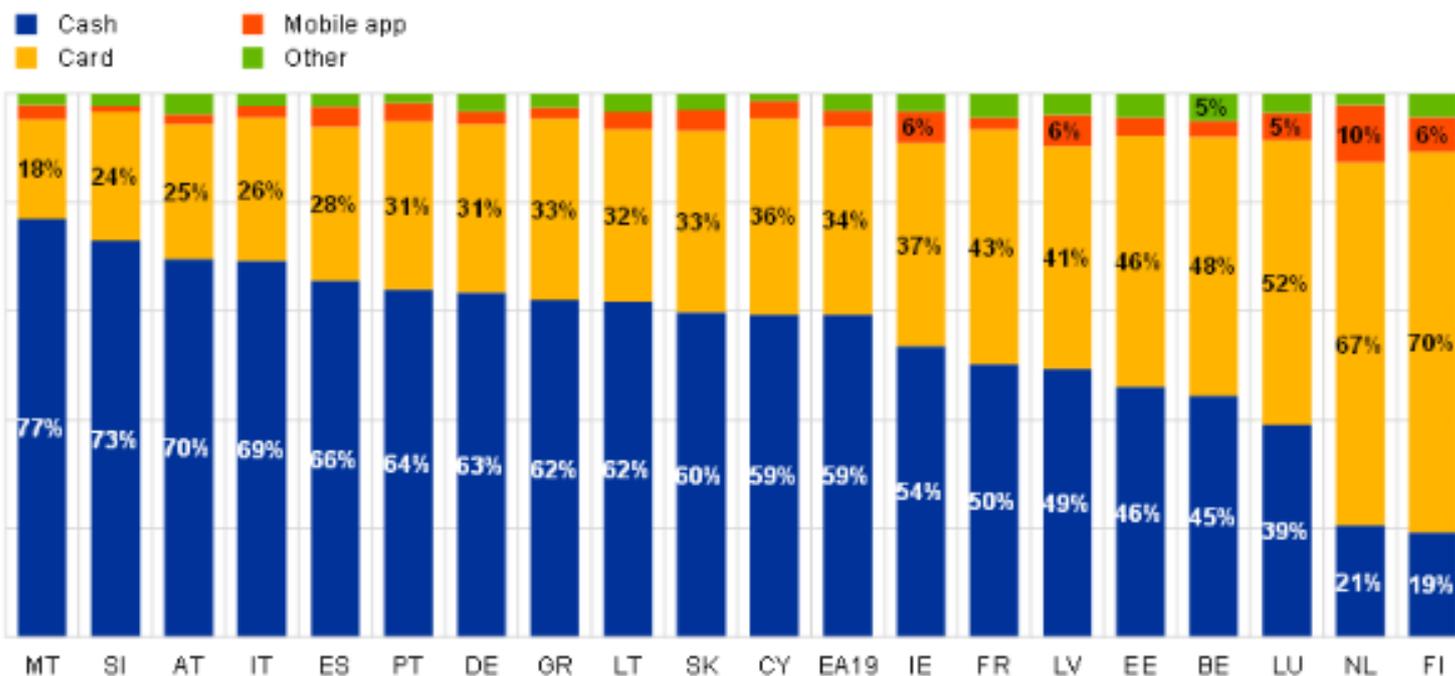
Heterogeneity: Payment instruments

Chart 5

Share of payment instruments used at the POS in terms of the number and value of transactions, 2022, by country

(percentages)

Number of transactions



Source: ECB SPACE 2022

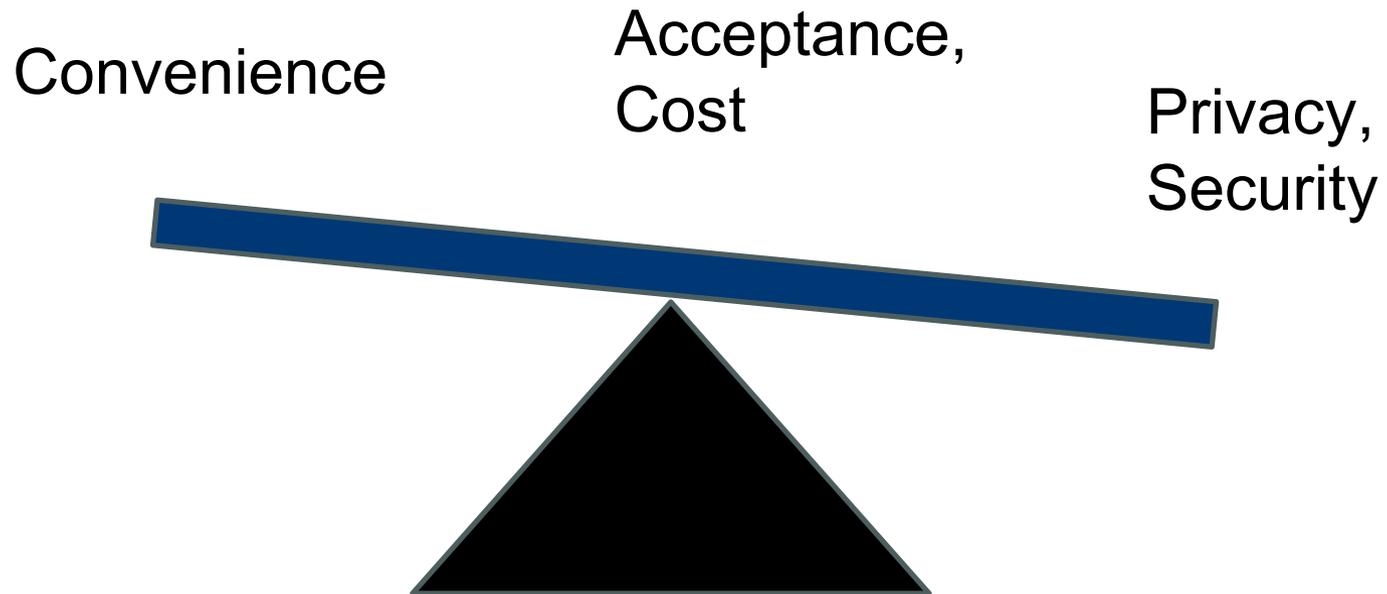
Research questions (i)

- How do complementarities among merchants (and consumers) affect acceptance & adoption of electronic payment instruments
 - [Higgins \(2024\)](#), [Crouzet et al. \(2023\)](#)
- **How does the design of payment instruments affect their adoption and use?**
 - [Brown et al. \(2022\)](#), [Brown et al. \(2024\)](#)
- How does regulation & entry affect pricing in payment networks
 - [Wang \(2024\)](#), [Huynh et al. \(2022\)](#)
- How do payment innovations affect financial intermediation ... and visa-versa?
 - [Argentieri-Mariani et al. \(2023\)](#), [Sarkisyan \(2024\)](#), [Berg et al. \(2024\)](#)

Recent questions (II)

- How do consumers manage money inventories & cash vs. cashless payments over time ?
 - [Huynh et al.\(2023\)](#), [Lippi & Moracci \(2024\)](#)
- How do cashless payments affect household finances?
 - [Aggarwal et al. \(2024\)](#) ; [Brown et al. \(2023\)](#)

Consumer's trade off to cashless payments





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The convenience of electronic payments and consumer cash demand



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ABSTRACT

How does the improved convenience of electronic payments affect consumer payment choice and cash demand? We study the staggered, quasi-random introduction of contactless debit cards by a retail bank. We use account-level data and compare transactions which are eligible for contactless authentication to transactions which are not. We identify a significant convenience effect on debit card use at the intensive margin. The convenience elasticity is strongest among younger clients. Treatment effects increase over time, coinciding with increasing merchant acceptance. The effect on cash demand is economically small and statistically insignificant. We also find no effect on consumer spending.

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Research Design

- Account * month data for 17K clients of retail bank 2016-2018
 - Debit card payments
 - ATM withdrawals

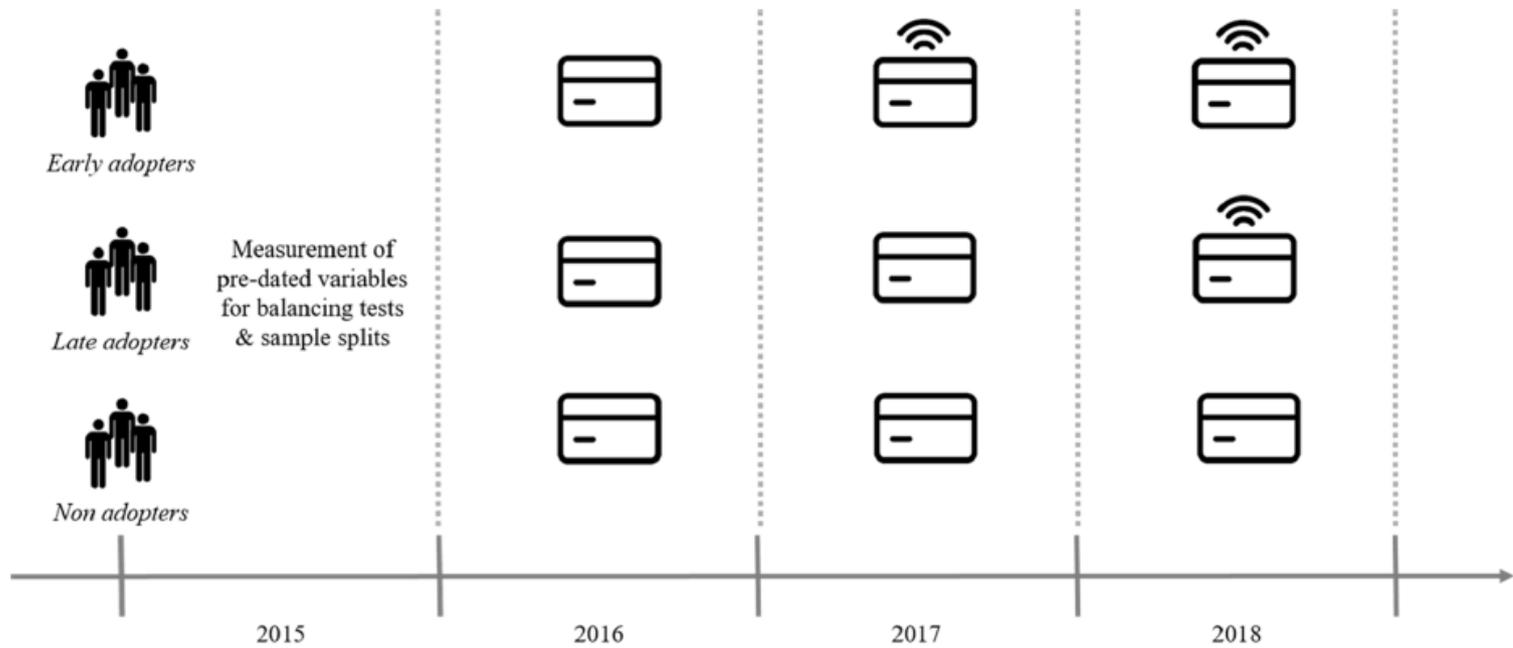
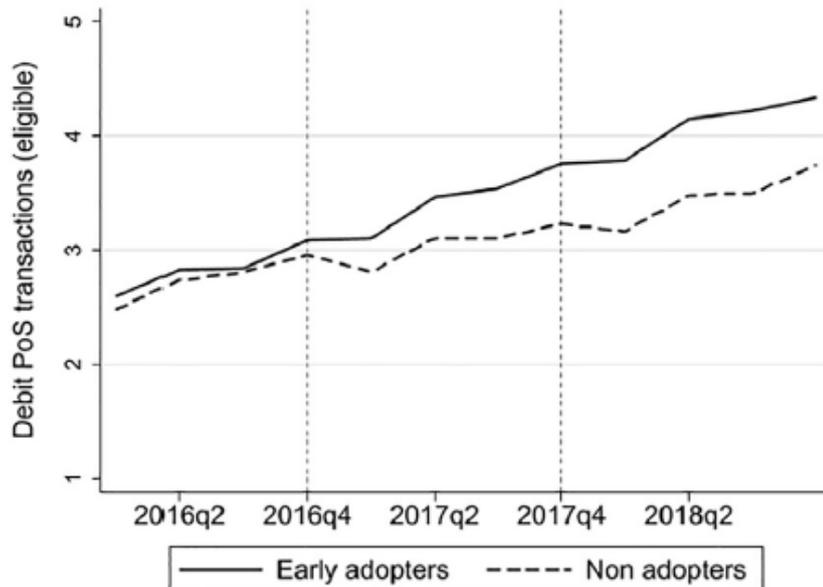


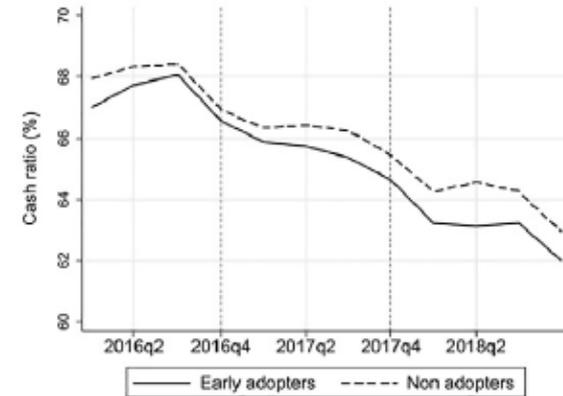
Fig. 1. Research design.

Main Results

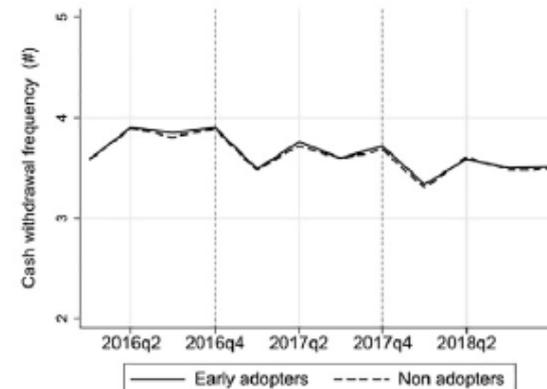
Panel A. Debit PoS transactions with a value of at most 40 CHF (eligible for contactless authentication)



Panel A. Cash ratio (%)



Panel B. Cash withdrawal frequency (average number per month)



Consumer Adoption & Use of Contactless Payments: The Role of Convenience

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Version: May 2024

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What do we do in this paper ?

- We study how improved convenience affects consumer adoption and use of contactless card payments
- We examine the April 2020 increase in the “Tap & Go” limit for contactless verification of card payments
- We analyse anonymised, transaction-level data
 - universe of retail electronic payments in Switzerland (almost)
 - hashed ID# for merchants & cards
- We compare the increase in contactless initiation of transactions
 - between cards that are differentially affected by the policy change
 - within cards for newly eligible vs. not-eligible transactions



Following the latest announcement of the international card organizations, Worldline will implement the new limits for contactless payments. The increase is part of measures to slow down the spread of coronavirus. We have summarised all current and future applicable limits for you.

Country	effective from date	Currency	Old limit	New limit
Austria	02.04.2020	EUR	25	50
Belgium	14.04.2020	EUR	25	50
Croatia	21.04.2020	HRK	100	350
Cyprus	07.04.2020	EUR	20	50
Czech Republic	07.04.2020	CZK	500	500
Switzerland	16.04.2020	CHF	40	80
United Kingdom	07.04.2020	GBP	30	45

Anonymized, Transaction-level Data

- Universe of retail electronic payments in Switzerland (almost)
 - Debit card, credit card & mobile payments
 - Domestic & foreign cardholders
 - Point of Sale (POS) & E-commerce
- Attributes per transaction
 - Transaction size & Time stamp
 - Payment instrument
 - **Contactless vs. contact-chip initiation**
 - Anonymized IDs of card and merchant
 - Merchant location (postcode)
 - Merchant type: 2-digit NACE

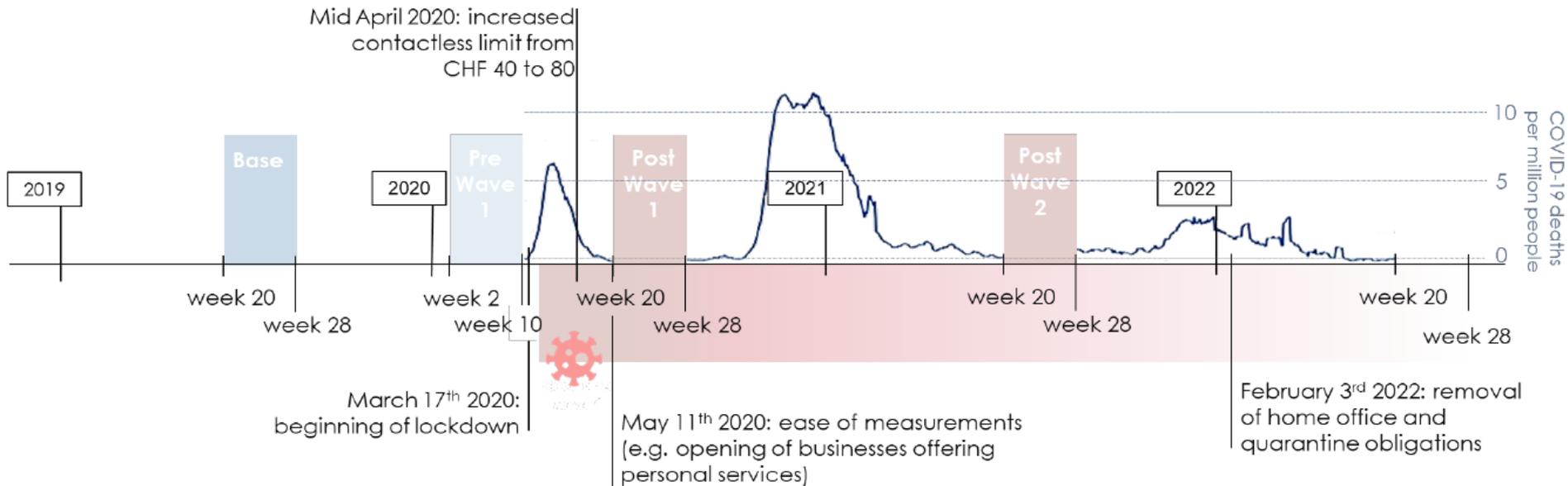


Measuring changes in payment behavior

- We want to:
 - analyze consumer adoption and use of contactless payments
 - disentangle changes in payment behavior from changes in spending
- Sample selection:
 - cards & merchants with known access to contactless technology
 - constant card*merchant relationships
 - constant calendar periods
- Data:
 - 975K merchant-card relationships
 - 406K cards & 18K merchants with 20M transactions
 - 2 main merchant categories: Retail trade, Food & beverage services

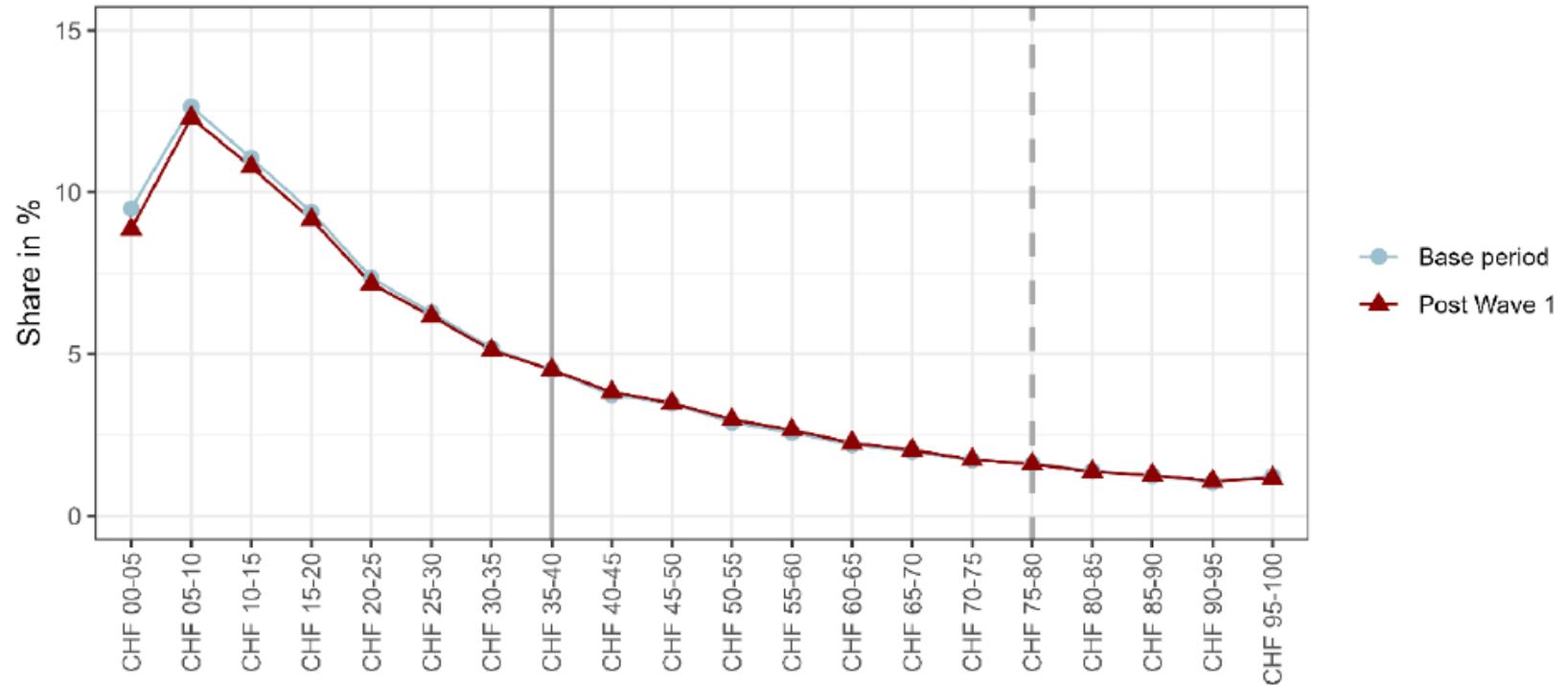
Constant calendar periods

Figure 1. Constant calendar periods of observation



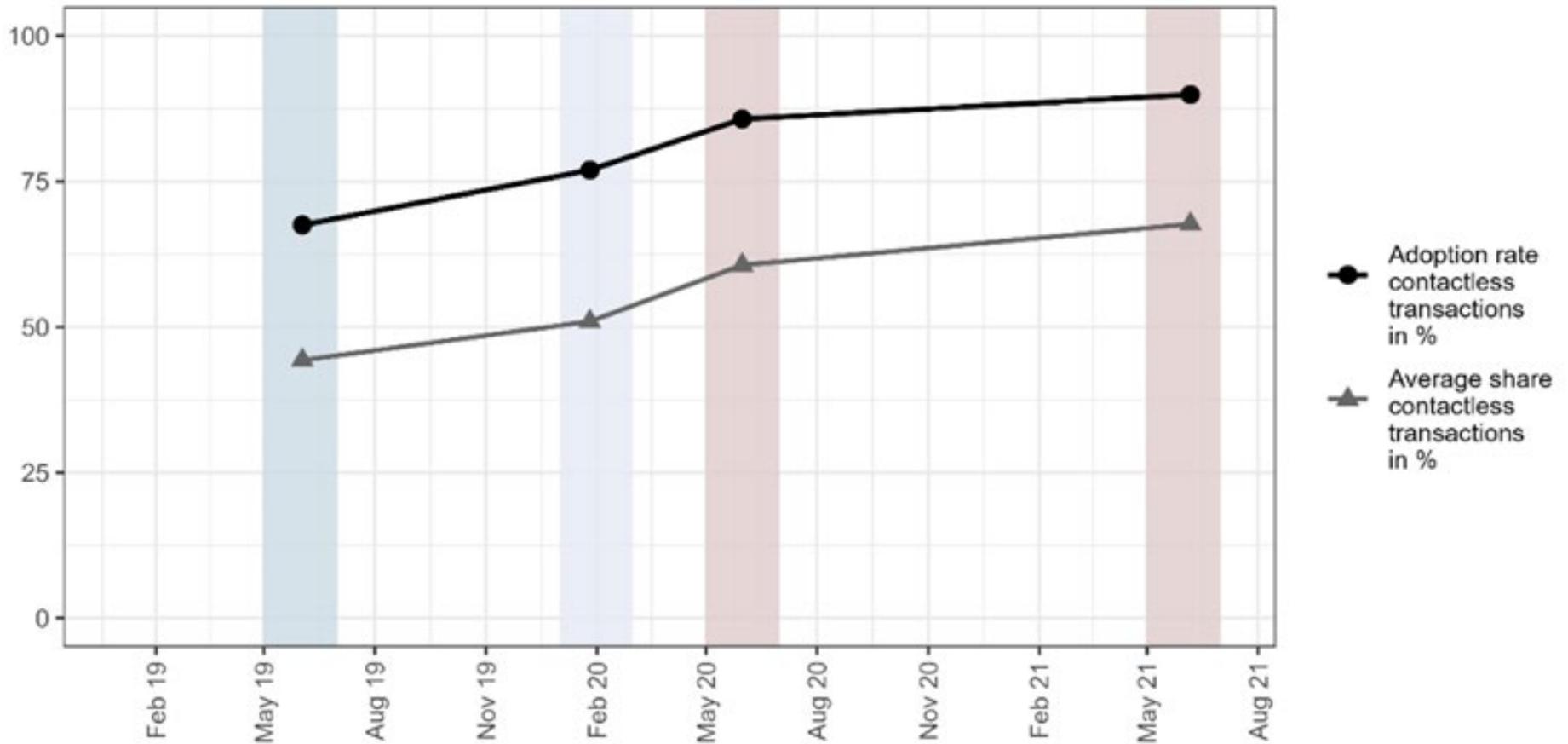
Stable composition of transactions

Figure 3. Distribution of Transactions by Size, Base period vs. Post Wave 1 period.



Source: own calculations, SNB, Worldline, PostFinance

Adoption and use of contactless payments

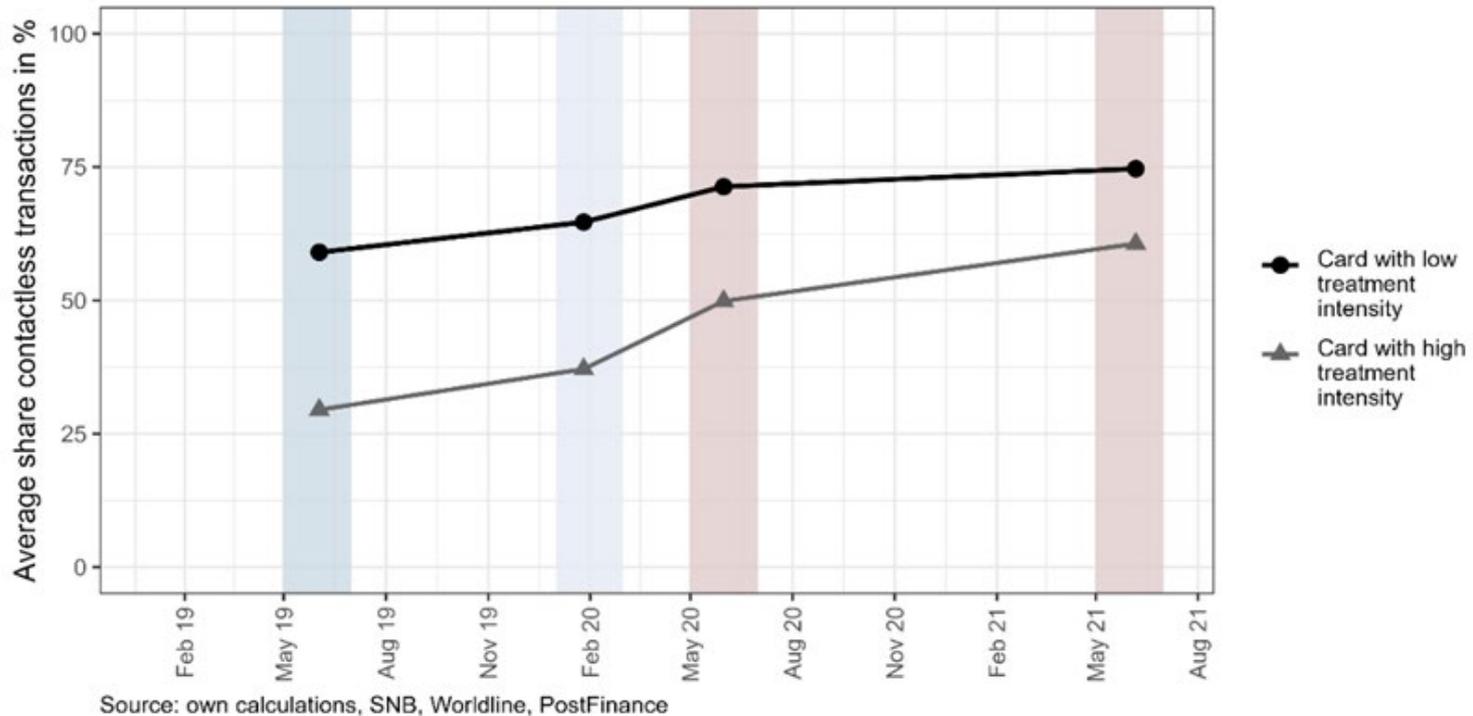


Source: own calculations, SNB, Worldline, PostFinance

Identification

- Potential effects of increased “tap & go” limit:
 - Consumers with contactless card use card more often (rather than cash)
 - Consumers without contactless card apply for and use card
 - **Consumers with contactless card use contactless initiation more often**
- Between-card analysis
 - We compare changes in contactless initiations of payments across cards with **different shares of treated transactions** (40-80 CHF)
- Within-card analysis:
 - We compare the changes in contactless initiation of payments by transaction size:
 - below 40 CHF (pre-treated)
 - 40-80 CHF (treated)**
 - above 80 CHF (not treated)

Between-card analysis: Use



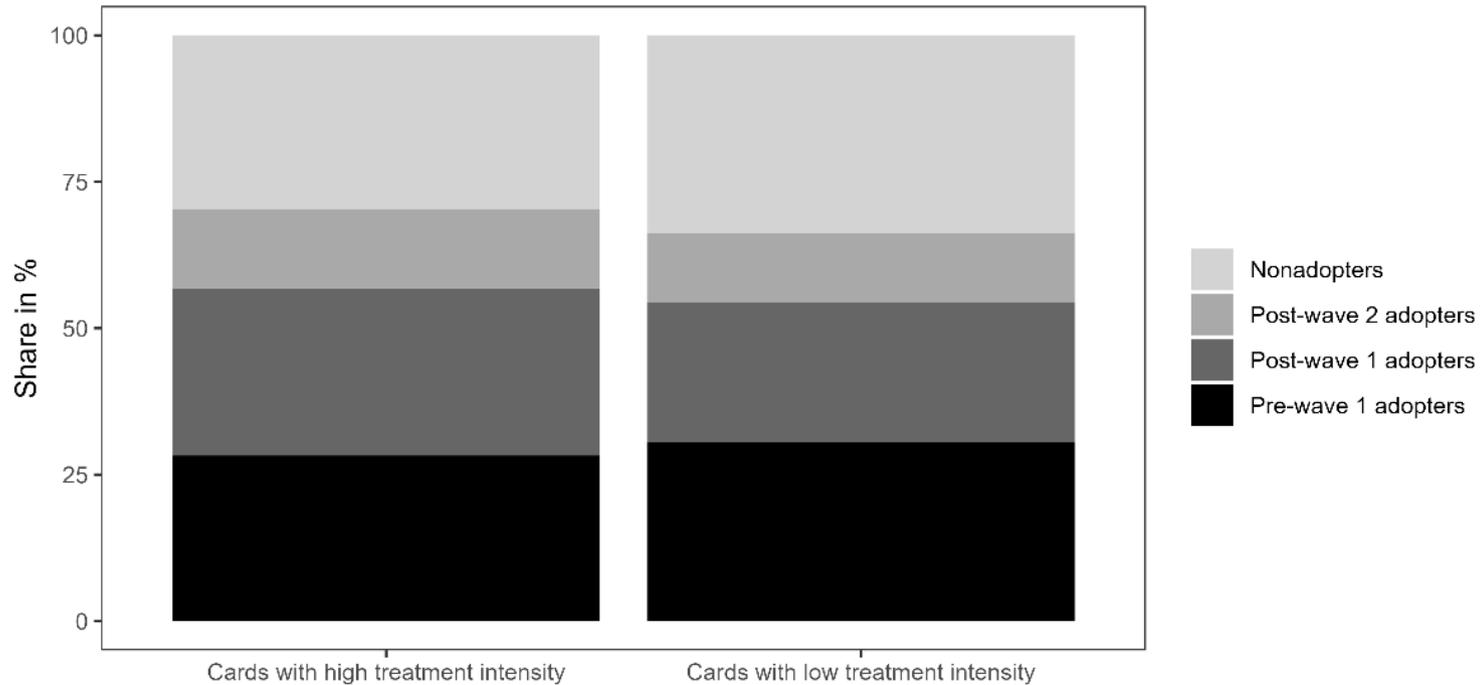
$$ShareContactless_{i,t} = a_i + \beta_1 * Post_t + \beta_2 * TreatmentIntensity_i * Post_t + \varepsilon_{i,t}$$

Treatment intensity: p25= 9%, p75 = 31%

Average increase in use by Post-Wave 1: 17pp

Estimated diff-in-diff effect (p75-p25): 4.4pp by Post-Wave 1

Between-card analysis: Adoption



Source: own calculations, SNB, Worldline, PostFinance

$$ContactlessAdopted_i = \beta_0 + \beta_1 * TreatmentIntensity_i + \gamma * X_i + \varepsilon_i$$

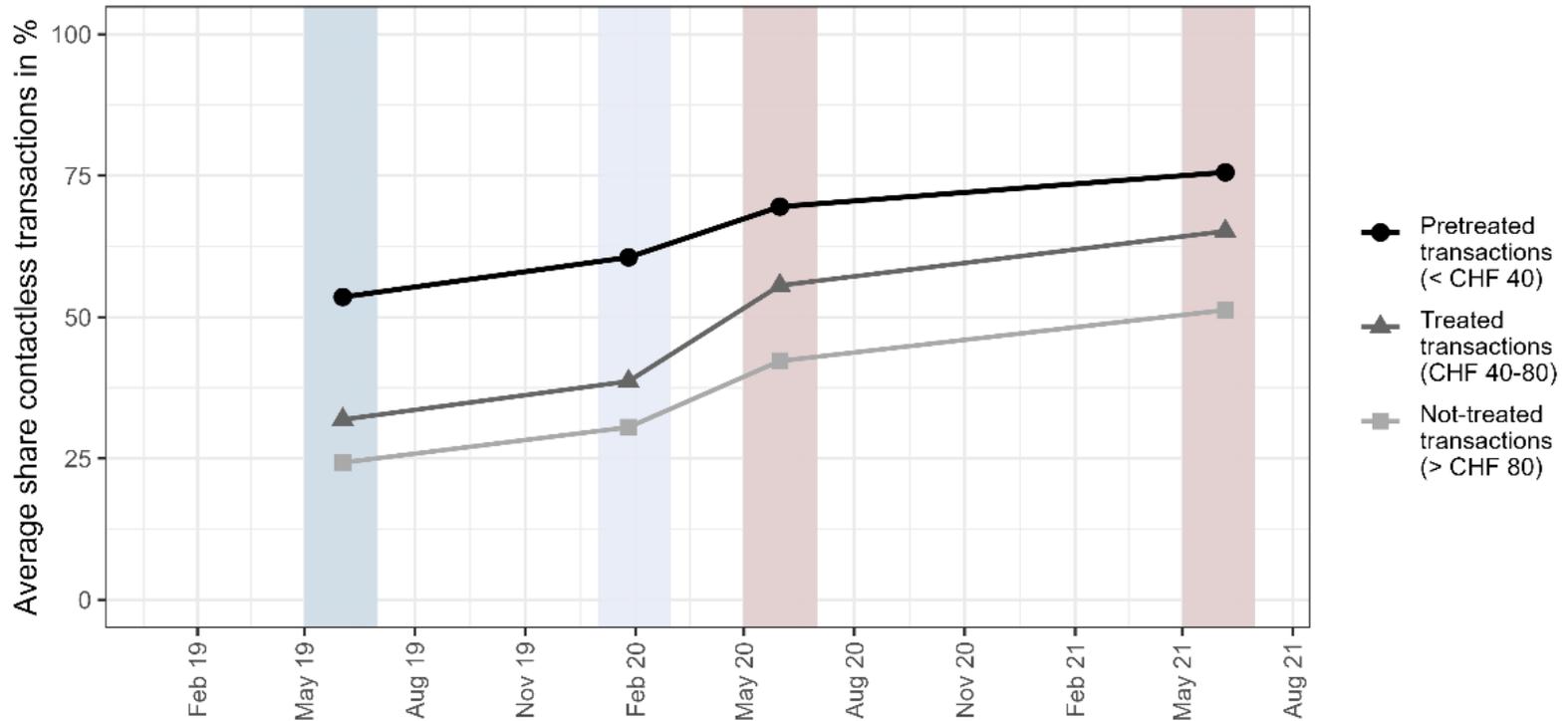
132'082 cards with no contactless transactions in Base period

Treatment intensity: p25= 9%, p75 = 31%

Estimated difference in adoption (p75-p25): 1.3pp by Post-Wave 1

Average first-time adoption by Post-Wave 1: 56%

Within-Card Analysis: Use



Source: own calculations, SNB, Worldline, PostFinance

$$ShareContactless_{i,j,t} = \alpha_i + \beta_1 * Treated_j + \beta_2 * Post_t + \beta_3 * Treated_j * Post_t + \varepsilon_{i,j,t}$$

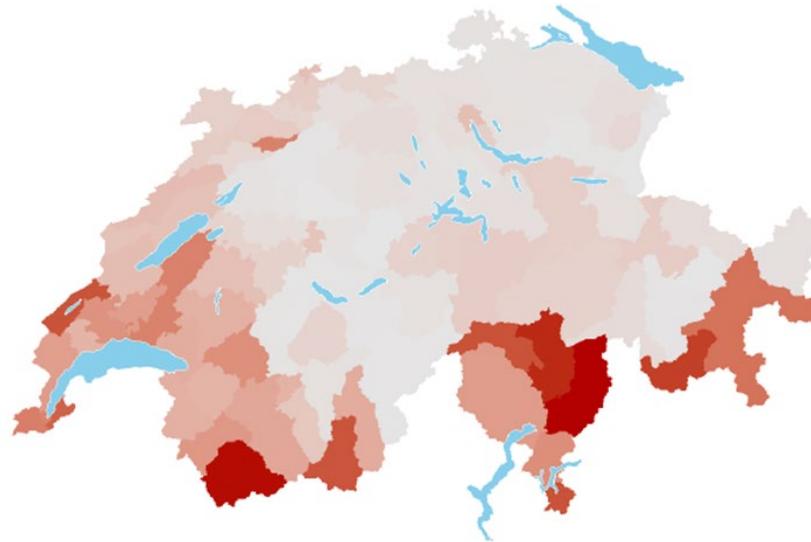
Estimated difference in increase for treated vs. non-treated transactions
(compared to Base period)

Post-wave 1: 8.1 pp ; Post-wave 2: 9.3 pp

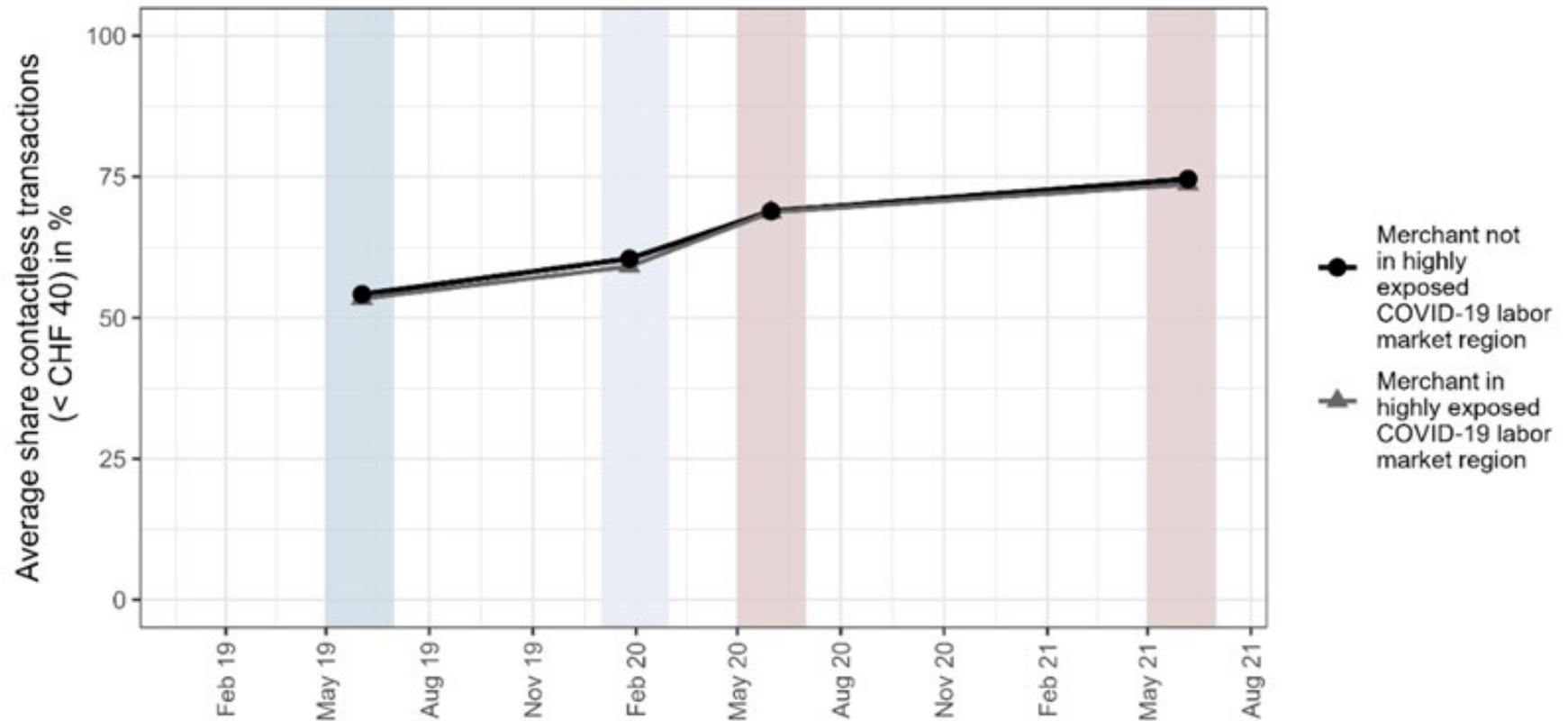
(Pre-wave 1: 0.2 pp)

Convenience vs. Hygiene

- We match merchant location to COVID-19 cases at the labor-market-region level
 - covid cases are highly correlated with regional hygiene concerns
- We control for confounding effects by merchant size and location (rural / urban, distance to border, demographics, language region)



Local COVID-19 exposure & contactless payments



Source: own calculations, SNB, Worldline, PostFinance

$$\begin{aligned} ShareContactless_{m,t} = & \alpha_m + \beta_1 * Post_t + \beta_2 * CovidExposure_m * Post_t \\ & + \gamma * X_m * Post_t + \varepsilon_{m,t} \end{aligned}$$

Summary

- We document a significant acceleration in the adoption and use of contactless payments which is not confounded by changes in technology availability or consumer spending behavior.
- Improved convenience due to the tap & go limit accounts for a sizeable share of the increased use of contactless payments
- Improved convenience accounts for only a negligible part of first-time adoption.
- Improvements in convenience affect payment technology use, but do not seem to be main trigger of first-time adoption

xtra

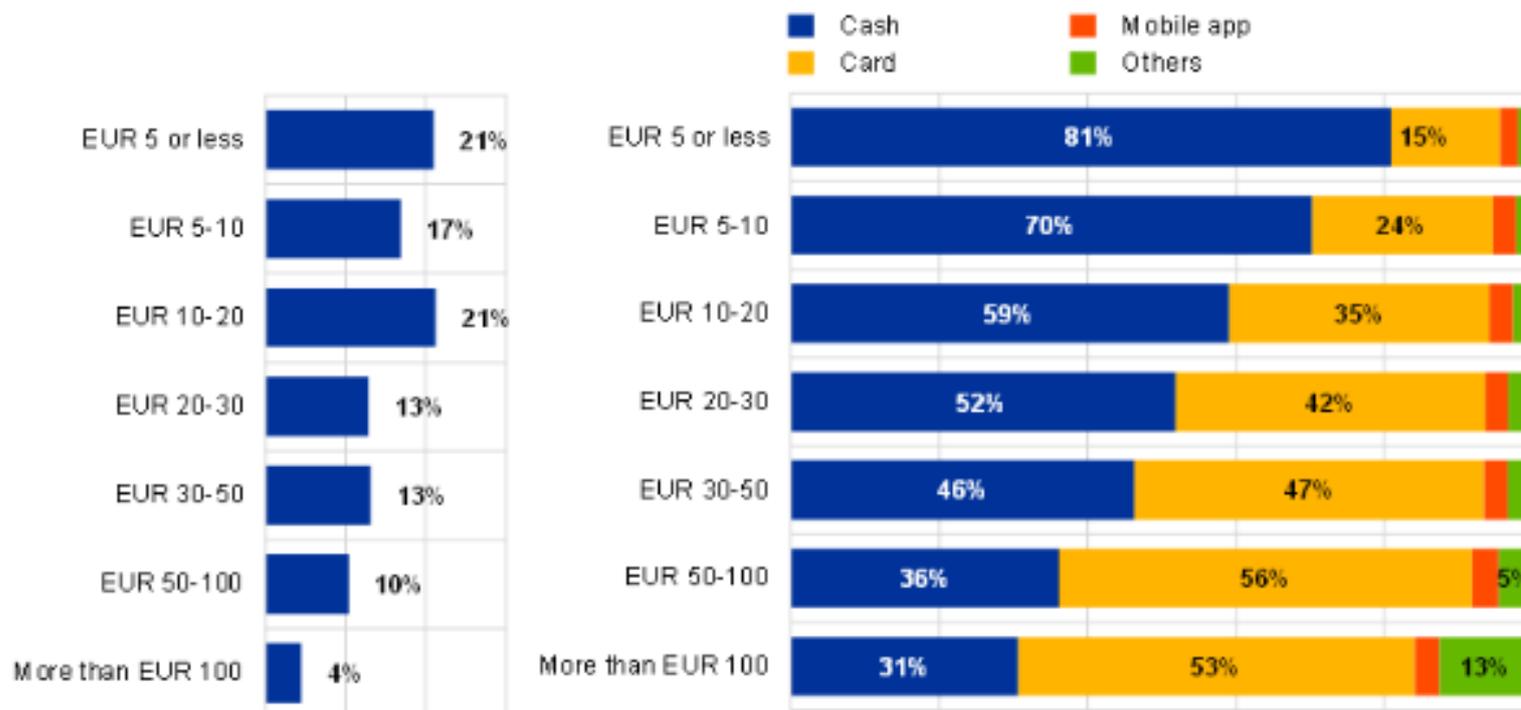
Heterogeneity: Transaction size

Chart 11

Breakdown of POS and online payments by value range and payment instrument, 2022, euro area

(percentages)

POS transactions



Source: ECB SPACE 2022

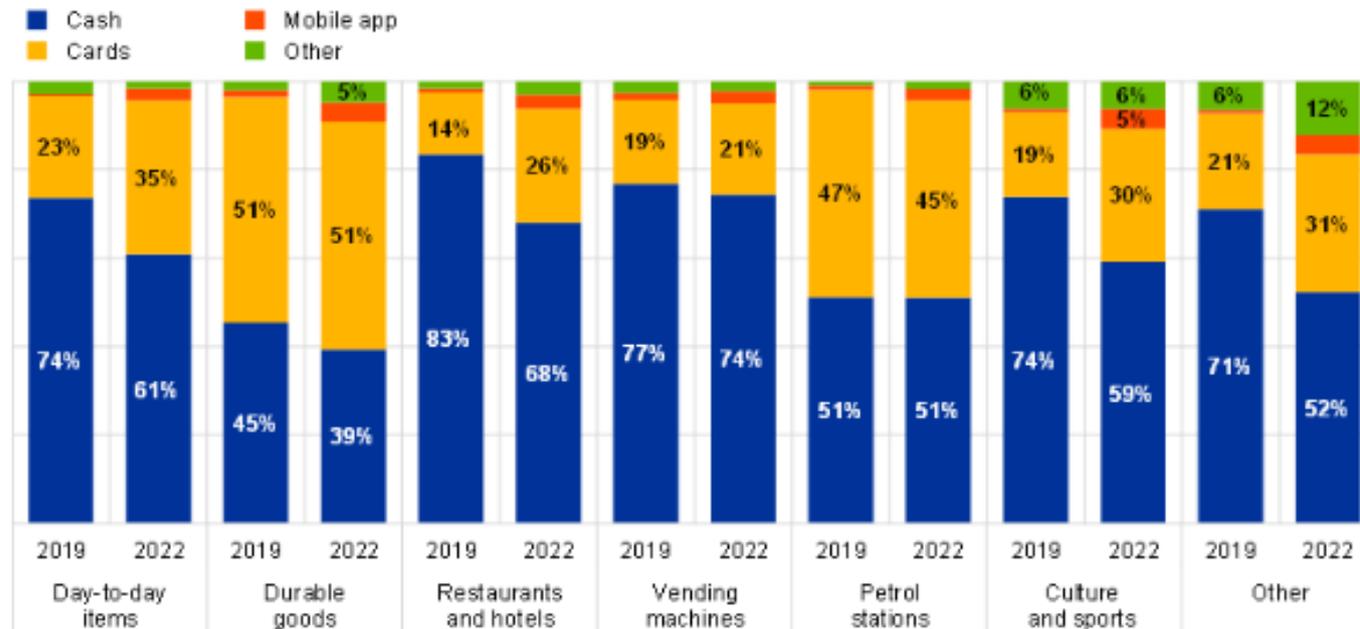
Heterogeneity: Merchants

Chart 13

Breakdown of POS payments by location and payment instrument, 2019 and 2022, euro area

(percentages)

Number of transactions



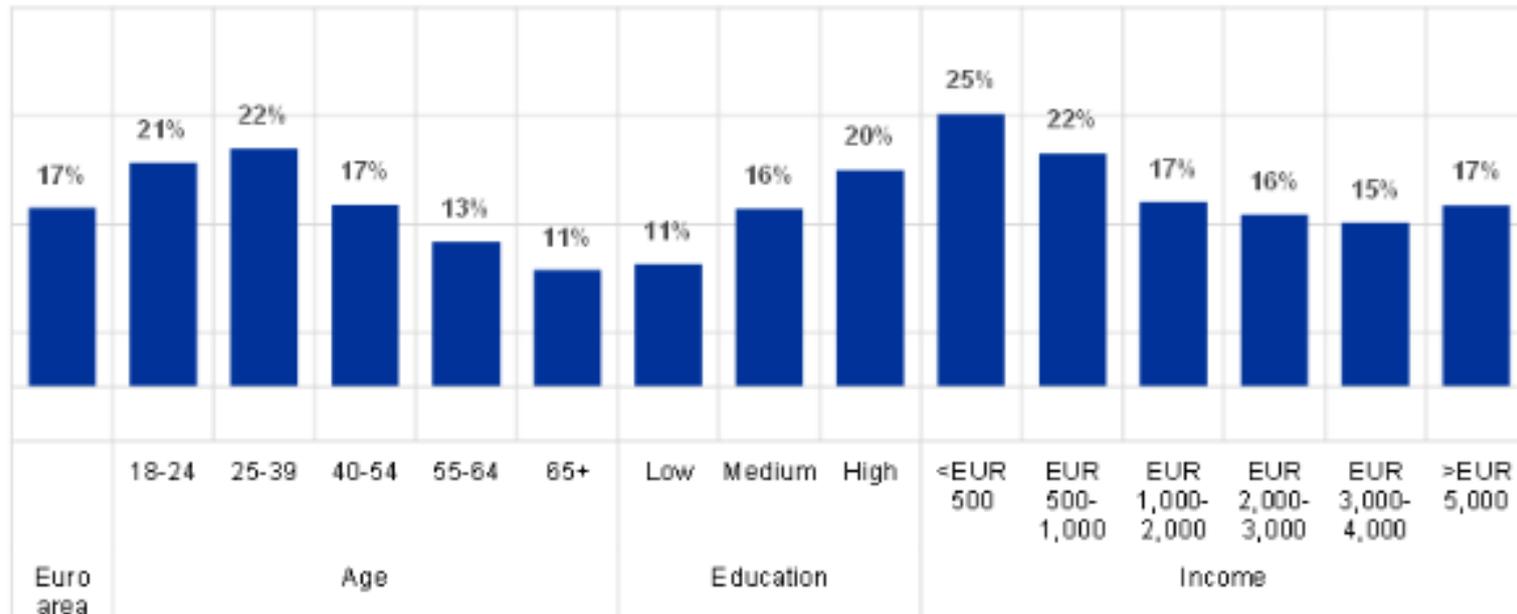
Heterogeneity: Sociodemographics

Chart 4

Share of online payments in consumers' non-recurring transactions in terms of number and value of transactions, 2019-2022, by population group

(percentages)

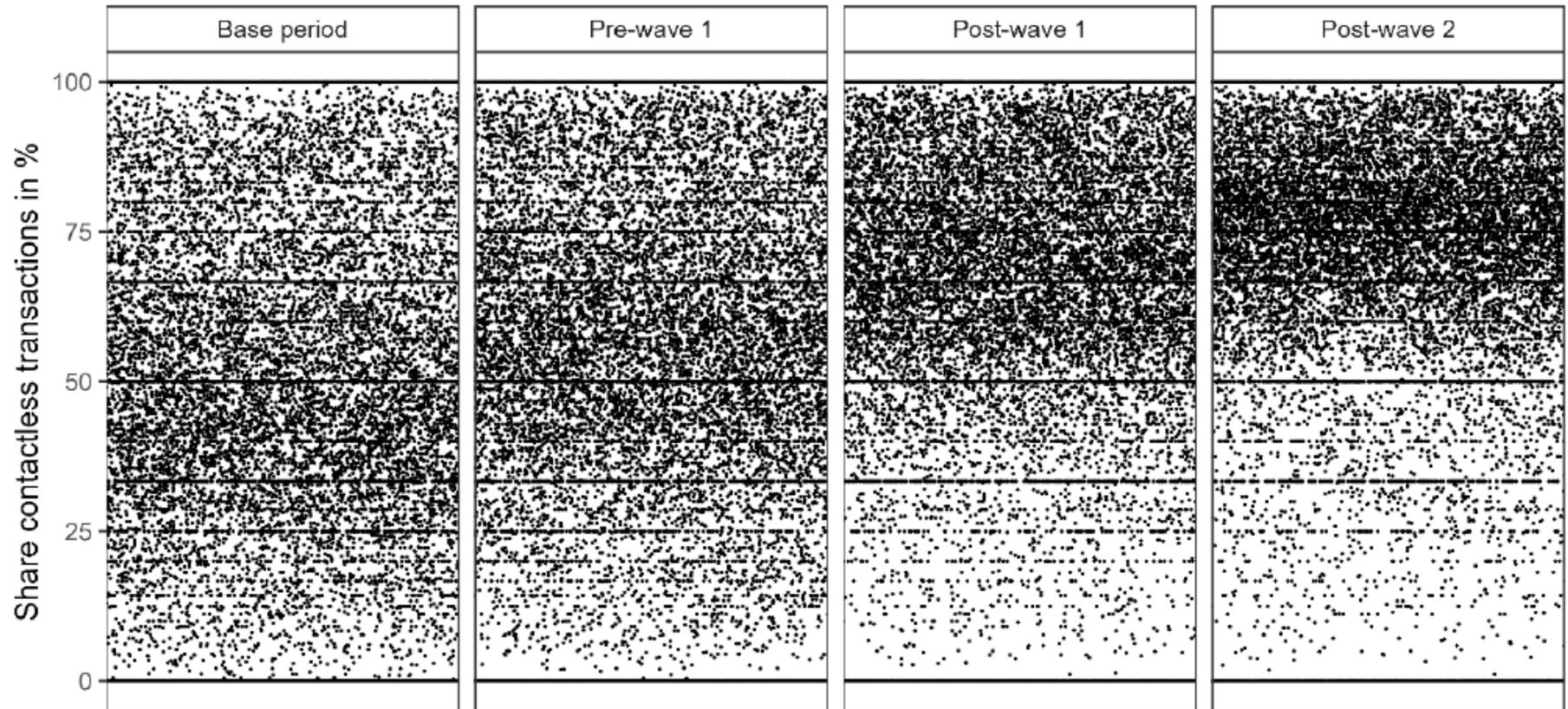
Number of payments



Source: ECB SPACE 2022

Merchant-level data

Figure 8. Share of contactless transactions at the merchant level



Source: own calculations, SNB, Worldline, PostFinance

Contribution to the literature

- Consumer adoption of payment technology
 - Shy (JEL 2023), Higgins (AER 2023), Brown et al. (JME 2022)
- Financial intermediaries and payments markets
 - Koulayev et al. (RAND 2016); Huynh et al. 2022; Wang 2023
 - Berg et al. (2023)
- COVID-19 and consumer behavior
 - Chetty et al. (QJE 2023); Goelsbee & Syverson (JPubE 2021)

Relevance

- Digital technology affects how we search for, select and pay for goods and services

Goldfarb & Tucker, JEL 2019

- Digital retail payments is the most common use of Financial Technology (FinTech) by consumers

Financial Stability Board, 2022

- Understanding the drivers of digital payments is highly relevant to monetary authorities

Within-Card Analysis

Table 2. The “tap and go” limit: Treated vs. control transactions

Panel A. Treated (CHF 40-80) vs. not-treated transactions (above CHF 80)

Outcome variable:	Contactless share of card payments (in %)		
Base period vs.	Post Wave 1	Post Wave 2	Pre Wave 1
Treated * Post	8.14*** (0.17)	9.28*** (0.20)	0.18 (0.13)
Post	18.08*** (0.11)	28.58*** (0.14)	7.07*** (0.09)
Treated	4.28*** (0.11)	4.28*** (0.13)	4.28*** (0.09)
Card fixed effects	Yes	Yes	Yes
Cards	65,072	65,072	65,072
Observations	260,288	260,288	260,288
R2, adjusted R2	0.76, 0.68	0.70, 0.60	0.85, 0.80

Table 2. The “Tap-and-go” limit: Between-card analysis

Panel A. Share of contactless transactions

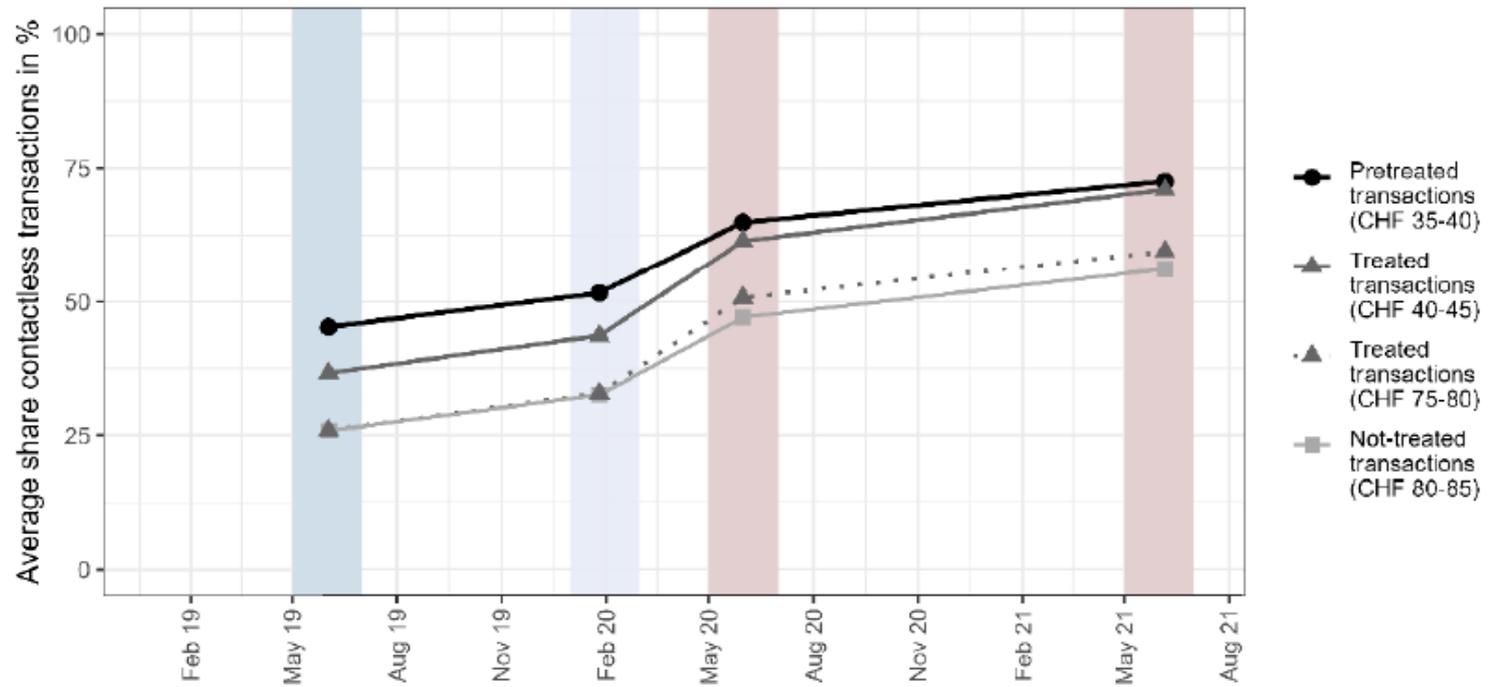
Outcome variable:	Share contactless transactions (in %) – <i>ShareContactless</i>		
Base period vs.	Post-wave 1	Post-wave 2	Pre-wave 1
<i>TreatmentIntensity</i> * Post	0.20*** (0.00)	0.40*** (0.00)	0.04*** (0.00)
Post	12.03*** (0.06)	14.48*** (0.08)	5.87*** (0.05)
Mean outcome variable in period (Base period)	61% (44%)	68% (44%)	51% (44%)
Card fixed effects	Yes	Yes	Yes
Cards	406,550	406,550	406,550
Observations	813,100	813,100	813,100
R2, adjusted R2	0.85, 0.70	0.77, 0.54	0.91, 0.82

Panel B. Adoption of contactless transactions

Outcome variable:	Adoption of contactless transactions (indicator) – <i>ContactlessAdopted</i>		
<i>ContactlessAdopted</i> in	Post-wave 1	Post-wave 2	Pre-wave 1
(Intercept)	0.5064*** (0.02)	0.6060*** (0.0162)	0.3060*** (0.02)
<i>TreatmentIntensity</i>	0.0004*** (0.00)	0.0005*** (0.0001)	-0.0001** (0.00)
Mean outcome variable in period	0.56	0.69	0.29
Card controls	Yes	Yes	Yes
Cards	132,082	132,082	132,082
Observations	132,082	132,082	132,082
R2, adjusted R2	0.002, 0.002	0.001, 0.001	0.009, 0.009

This table presents estimated coefficients for *ShareContactless* in our regression Equation [1] for (Panel A) and *ContactlessAdopted* in our regression Equation [2] (Panel B). Columns 1 to 3 in both panels compare the outcome variable in the Base period to that in the Post-wave 1, Post-wave 2 and Pre-Wave 1 period, respectively. Heteroskedasticity-robust standard errors are presented in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel B. Transactions in narrow ranges around “tap-and-go” limits



Source: own calculations, SNB, Worldline, PostFinance

Table 3. The “tap-and-go” limit: Within-card analysis

Panel A. Treated (CHF 40-80) vs. not-treated transactions (above CHF 80)

Outcome variable:	Share of contactless transactions (in %) – <i>ShareContactless</i>		
Base period vs.	Post-wave 1	Post-wave 2	Pre-wave 1
<i>Treated</i> * Post	8.14*** (0.17)	9.28*** (0.20)	0.18 (0.13)
Post	18.08*** (0.11)	28.58*** (0.14)	7.07*** (0.09)
<i>Treated</i>	4.28*** (0.11)	4.28*** (0.13)	4.28*** (0.09)
Mean outcome variable in period (Base period)	49% (27%)	60% (27%)	34% (27%)
Card fixed effects	Yes	Yes	Yes
Cards	65,072	65,072	65,072
Observations	260,288	260,288	260,288
R2, adjusted R2	0.76, 0.68	0.70, 0.60	0.85, 0.80

Panel B. Treated (CHF 40-80) vs. pretreated transactions (below CHF 40)

Outcome variable:	Share of contactless transactions (in %) – <i>ShareContactless</i>		
Base period vs.	Post-wave 1	Post-wave 2	Pre-wave 1
<i>Treated</i> * Post	4.87*** (0.17)	7.25*** (0.20)	-0.93*** (0.15)
<i>Post</i>	21.36*** (0.12)	30.60*** (0.14)	8.17*** (0.11)
<i>Treated</i>	-13.77*** (0.13)	-13.77*** (0.14)	-13.77*** (0.11)
Mean outcome variable in period (Base period)	60% (36%)	70% (36%)	44% (36%)
Card fixed effects	Yes	Yes	Yes
Cards	65,072	65,072	65,072
Observations	260,288	260,288	260,288
R2, adjusted R2	0.76, 0.68	0.70, 0.60	0.82, 0.76

Table 4. Merchants and COVID-19 exposure

Outcome variable:	Share of contactless transactions (in %) – <i>ShareContactless</i>		
Base period vs. Transaction range	Post-wave 1	Post-wave 2 below CHF 40	Pre-wave 1
<i>CovidExposure</i> * Post	-0.20* (0.08)	-0.33** (0.10)	0.00 (0.07)
Mean outcome variable in period (Base period)	69% (54%)	74% (54%)	60% (54%)
Merchant fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Merchant * period controls	Yes	Yes	Yes
Region * period controls	Yes	Yes	Yes
Merchants	15,436	15,363	15,394
Observations	30,872	30,726	30,788
R2, adjusted R2	0.86, 0.73	0.81, 0.62	0.89, 0.78