HOUSEHOLD SUSTAINABILITY

ABFER MASTERCLASS

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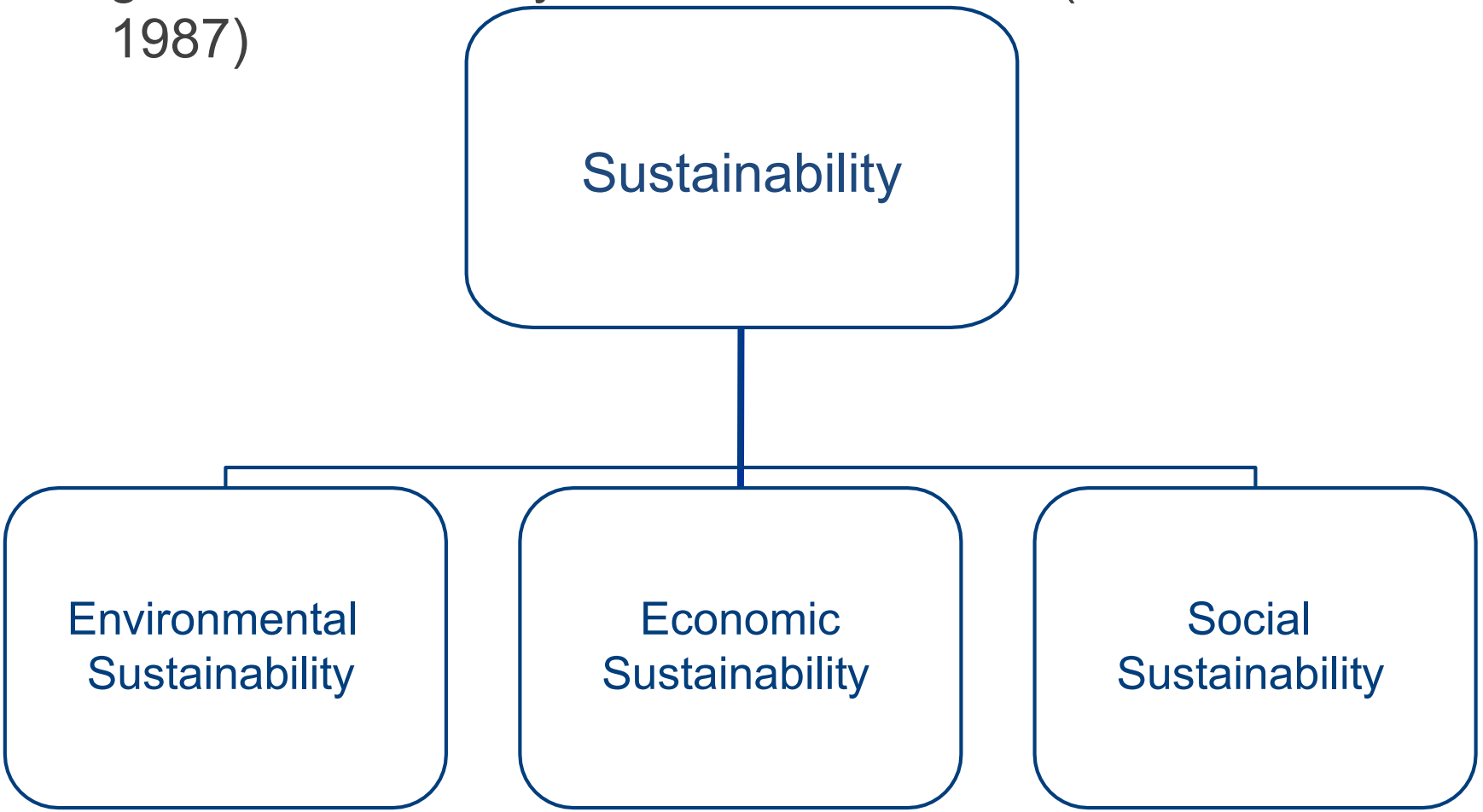
Definition of Sustainability

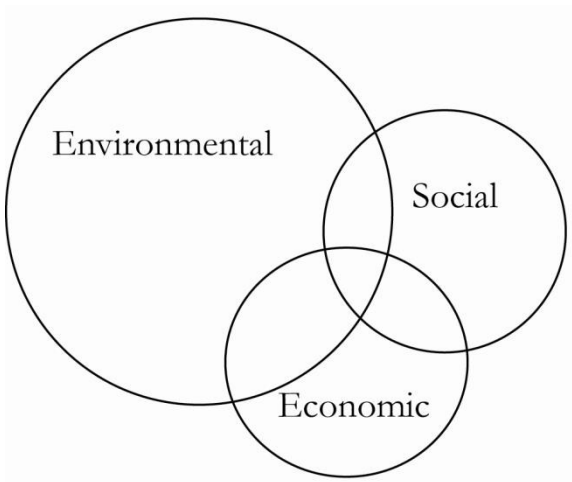
Meetings today's needs without compromising future generations' ability to meet their needs (Brundtland, 1987)



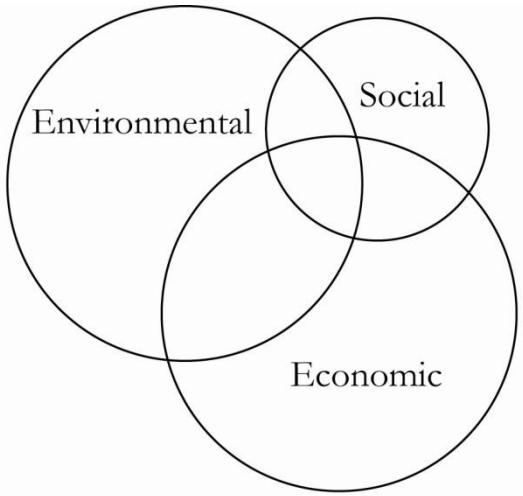
Sustainability

The 3 dimensions of sustainability was first mentioned in 1992 at the Earth Summit in Rio, Brazil and adopted in the Agenda 21 by 178 countries.

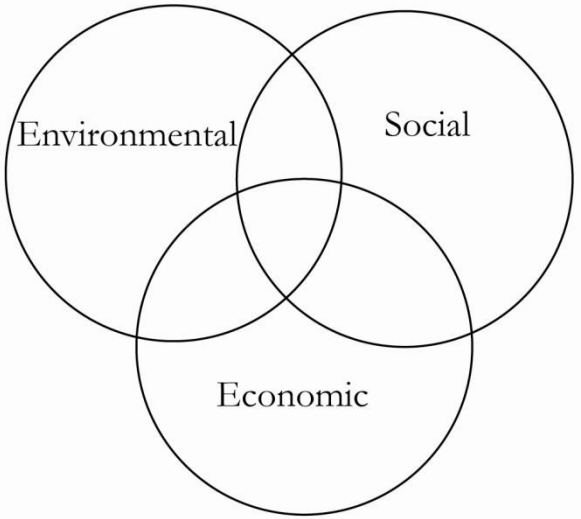
However, the U.N. sustainable development goals (SDG) now include 17 goals and 169 targets.



1980s /mid-1990s



late 1990s



2000s, balance?

Source: Alter from Marghescu (2005)

Economics of Sustainability

- This raises fundamental issues for economics
  - Concern for the long-run growth (descendants)
  - Constraints placed on human society

- Do we need new frameworks to think intelligently about both of the issues?
  - No, they are captured by existing framework

- Concerns for intergenerational welfare dates back to Ramsey (1928)
  - "*Discounting future utilities is ethically indefensible and arises purely from a weakness of the imagination*"

Household Sustainability

Households make social, environmental, and financial choices and decision on day-to-day basis.

Understanding how these choices across these three dimensions interact and influence each other to maximize their current utility without hurting the utility of future generations.

Household Sustainability

- Environmental Sustainability
  - Household usage of utilities, transportation, and food consumption.
  - Can we reduce our water and electricity consumption.
  - Choosing between owing a car vs. ride sharing, vs. public transportation.
  - Choosing to consumer beef based protein diet a ruminant livestock vs fish based protein diet with a low carbon footprint. The difference in the carbon footprint is more than 20 times.

Household Sustainability

- Financial Sustainability
  - Role of financial literacy and education in financial decision making.
  - Mistakes in using financial products, ARM-FRM, mortgage refinancing, fee payments, etc.
  - Consumption and savings decisions.
  - Under-participation and under-diversification in the stock market.

Household Sustainability

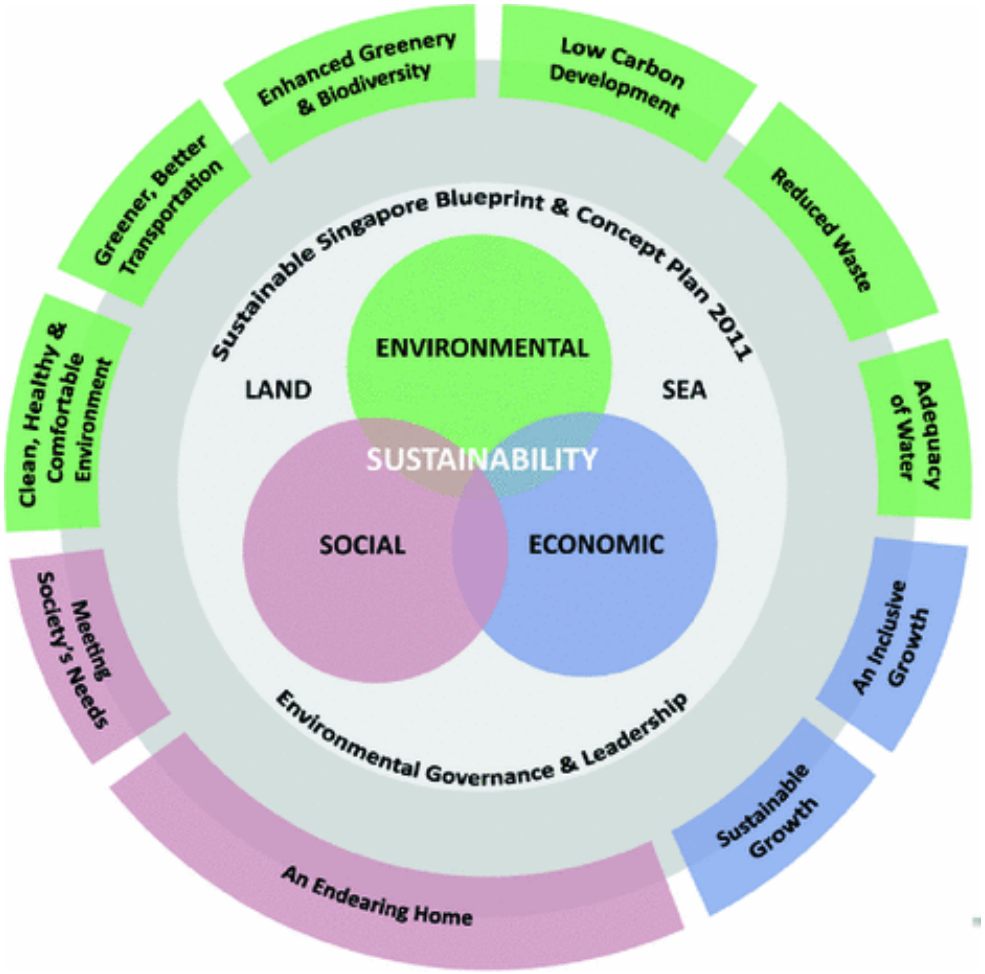
- Social Sustainability
  - Gender wage gap, woman's education, minimum wages to protect labor exploitation.
  - Aging population and retirement safety.
  - Intergenerational and income inequality.
  - Health safety and security.
  - Transportation

Household Sustainability

- Environmental, Financial and Social Sustainability
  - Minimum wage effects on household spending and debt
  - Changes in environment laws and policies on housing demand and prices
  - Consumption choices and impact on carbon footprint
  - Two child policy changes and impact on woman's wages.

Household Sustainability

- Application in Singapore



Building a Individual Sustainable Scorecard

We have an financial scorecard around the world (FICO)

We will need to build an individual carbon scorecard

We also need to build an individual social scorecard

Also build a SME carbon scorecard

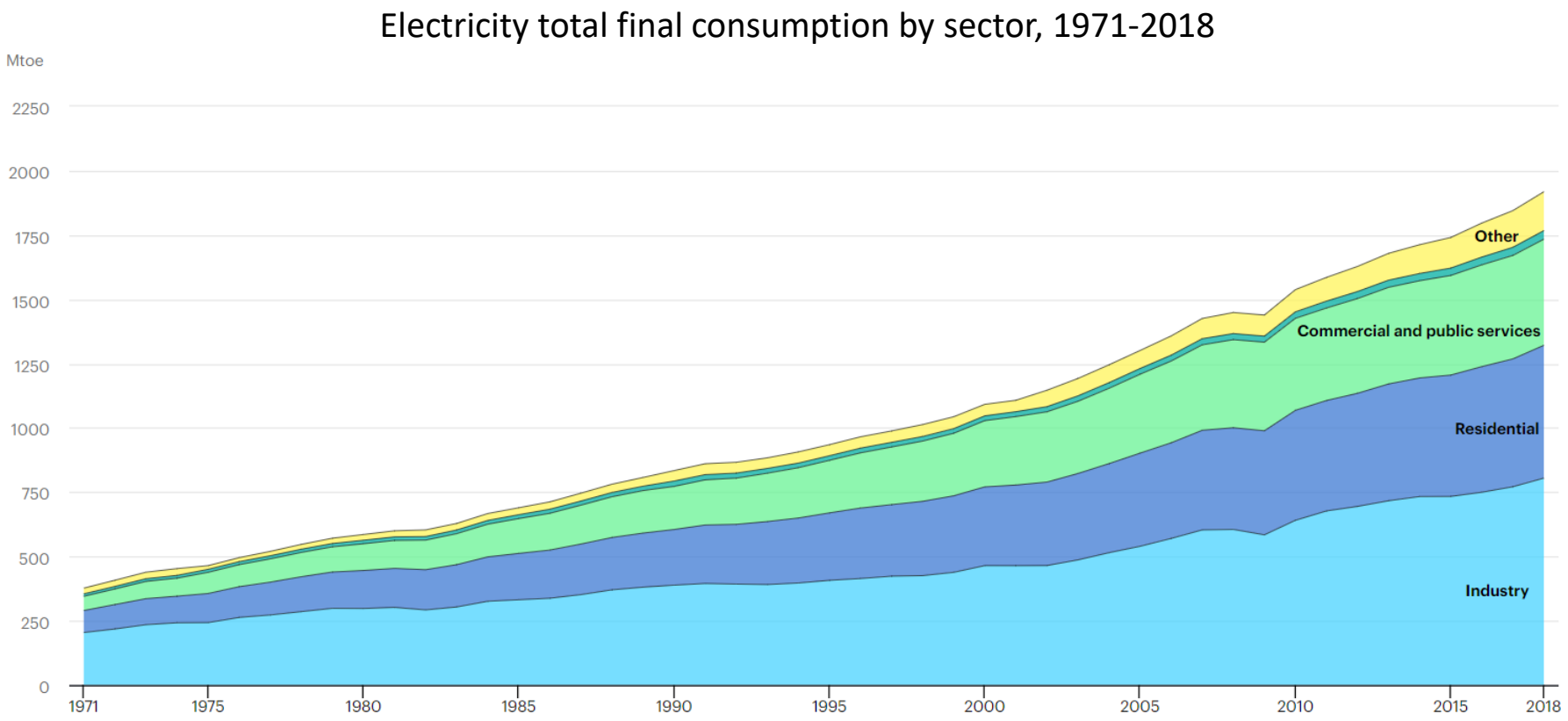
Research Questions

Environmental Sustainability

Source: Key world energy Statistics, IEA

Environmental Sustainability

- The last few decades have witnessed a steady rise in energy use by the household sector

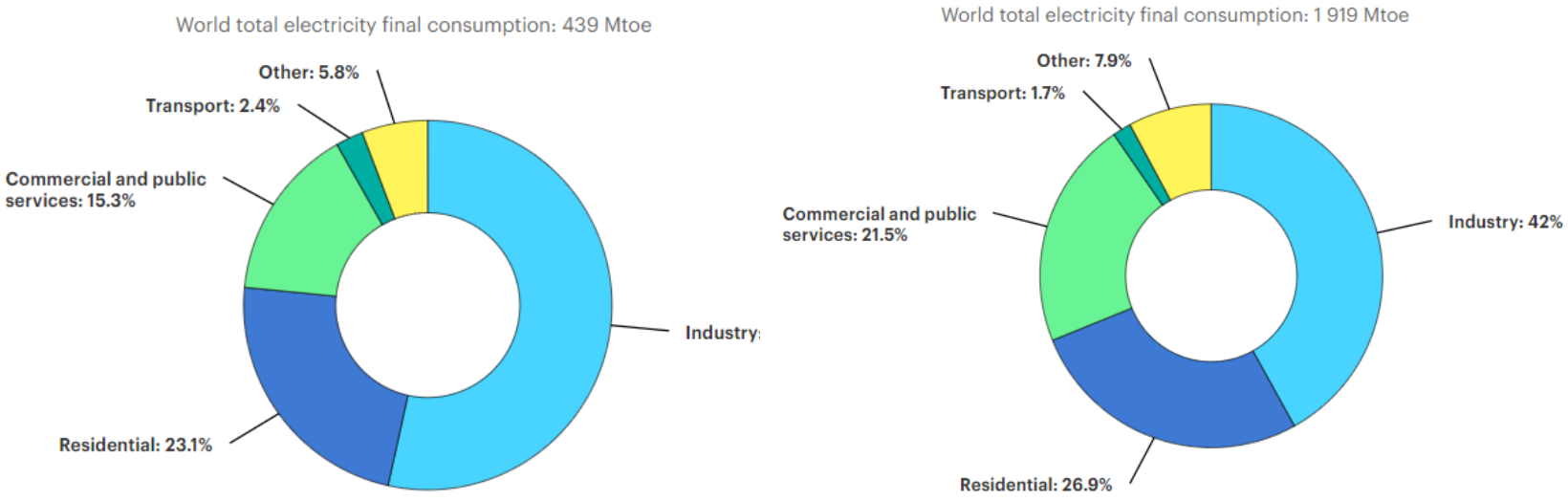


Source: Key world energy Statistics, IEA

Environmental Sustainability

- The residential sector gains increasing relative importance

Electricity total final consumption by sector, 1973(left) vs 2018(right)

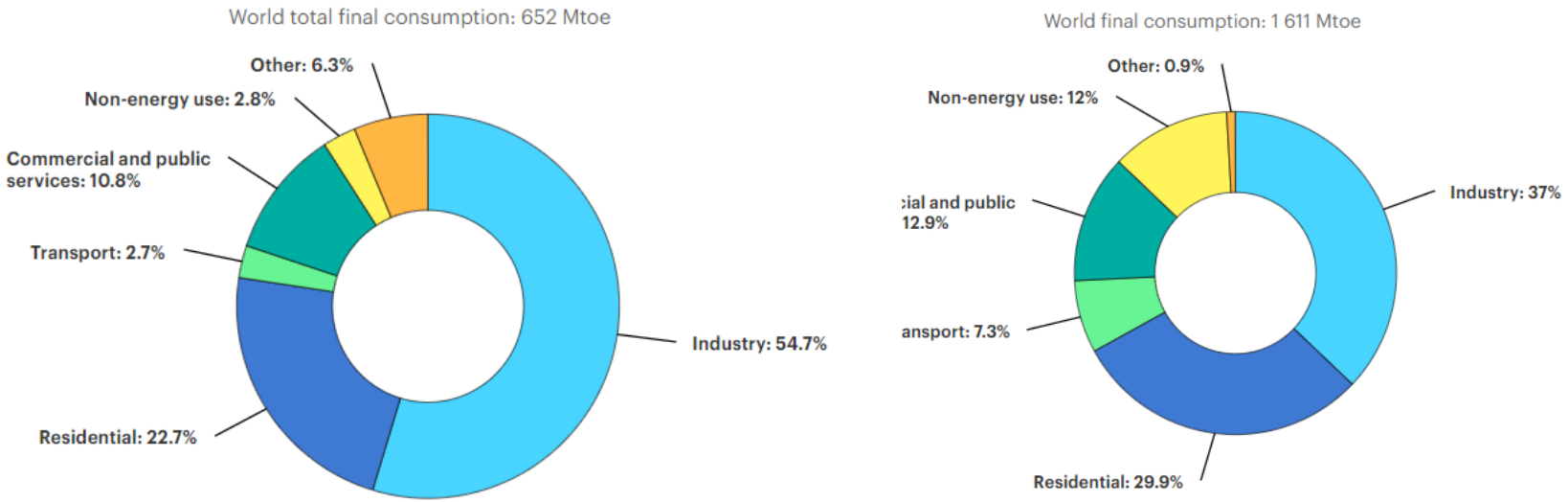


Source: Key world energy Statistics, IEA

Environmental Sustainability

- Similar pattern applies for other energy sources

Natural gas total final consumption by sector, 1973(left) vs 2018(right)



Source: Key world energy Statistics, IEA

Environmental Sustainability

- Critical to understand household energy consumption and measures to improve energy efficiency

- Common factors at play
  - Incentive via pricing/subsidies
  - Social interaction/Nudging
  - Externalities (i.e. noise pollution)

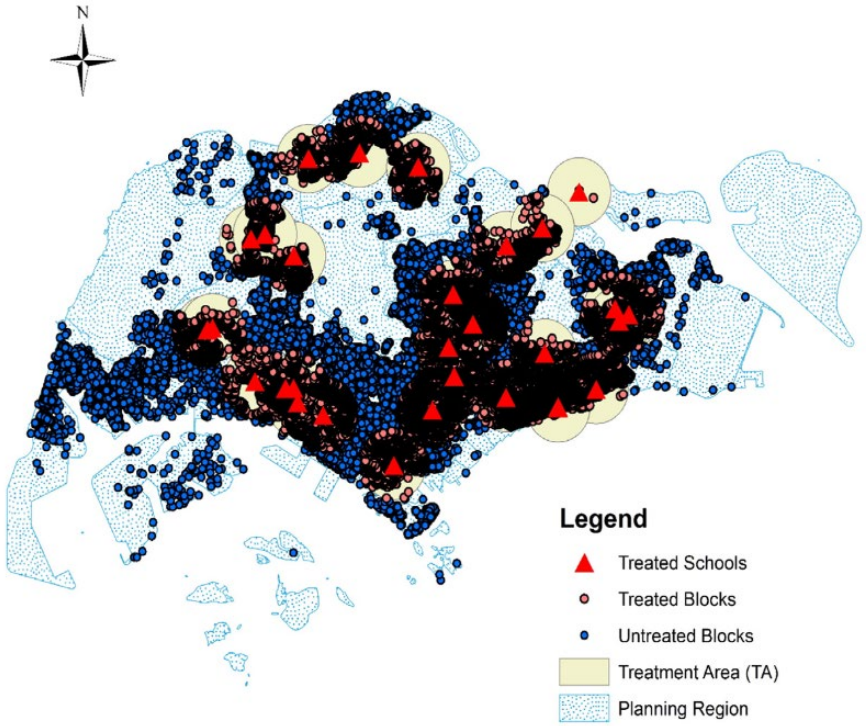
Nudging from the Child

Can school children Nudge influence energy-saving behaviors of families and neighbors[1]?

- "Project Carbon Zero" in 2009
  - Launched by NEA and SEC and targeting school children
  - Reduce overall electricity usage at home by 10% or more.

- Identification Strategy – D-I-D
  - 2 km home–school radius to sort the housing blocks into treated and control
  - Testing the effect during the intervention period and thereafter

Treated and control areas surrounding the participating schools

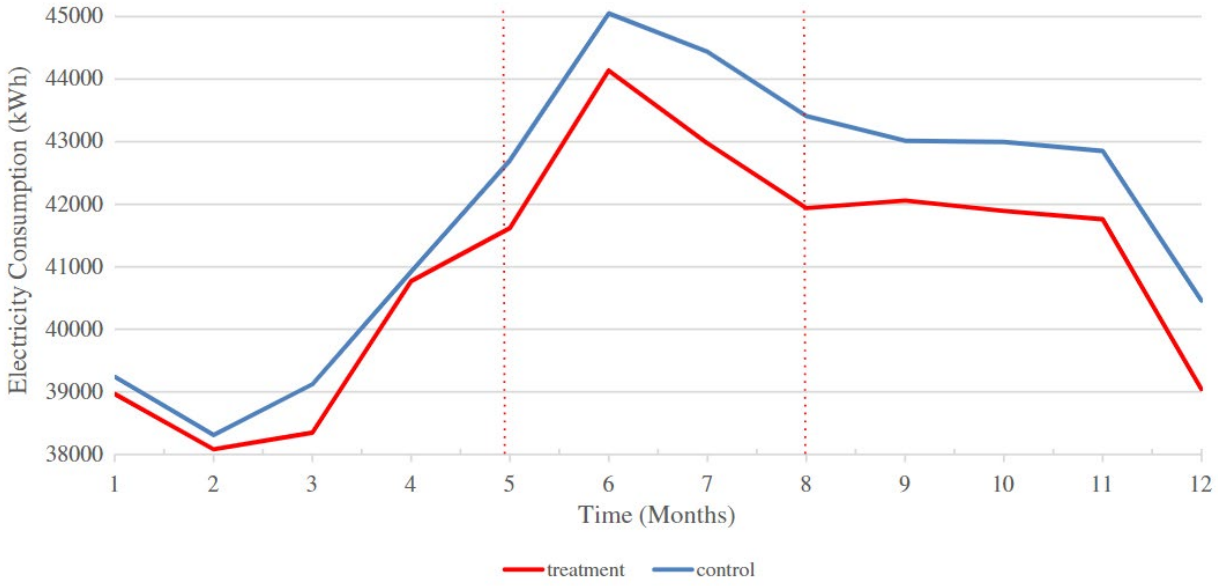


1.Agarwal, S., Rengarajan, S., Sing, T. F., & Yang, Y. (2017). Nudges from school children and electricity conservation: Evidence from the "Project Carbon Zero" campaign in Singapore. *Energy Economics*, *61*, 29-41.

Nudging from the Child

The energy saving campaign is effective:

- A reduction in electricity consumption by 1..8%
- The effect persist with a further energy saving of 1.6%
- Treatment effects are heterogenous and stronger for
  - Primary school students
  - More energy-efficient private housing



Peer Effect in Water Conservation*

- Social interaction plays a pivotal role in the diffusion of many new technologies and practices and influence household decisions

- Examine whether household's water consumption is influenced by the water consumption of nearby households in the previous year in Phoenix, Arizona.

- Exploiting variation from movers and using turnover in nearby homes as instrument
  - Housing turnover should not influence water consumption

- Findings
  - A one-gallon decrease in average consumption by neighbors living within 500-foot radius leads to a reduction by 0.25 ccf

*. Bollinger, B., Burkhardt, J., & Gillingham, K. T. (2020). Peer effects in residential water conservation: Evidence from migration. *American Economic Journal: Economic Policy*, *12*(3), 107-33..

Peer Effect in Water Conservation

Landscape greenness is a primary factor:

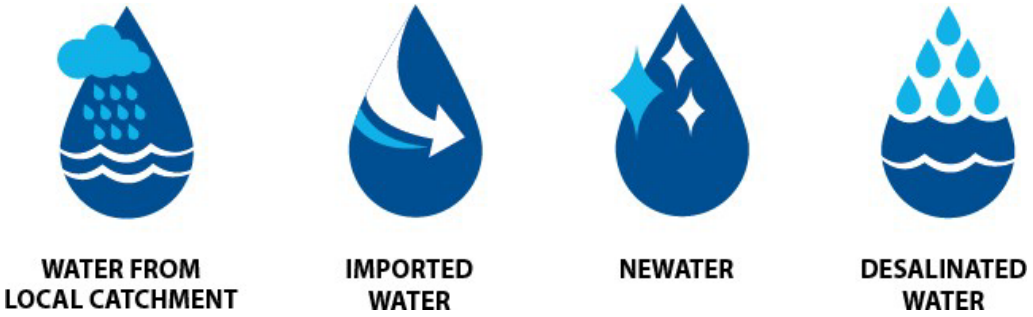
- Machine learning to classify the greenness
- Households convert to dry landscaping after observing and/or discussing such a conversion by their neighbours

ML coding the pixels of green space from remote sensing images

Water Scarcity

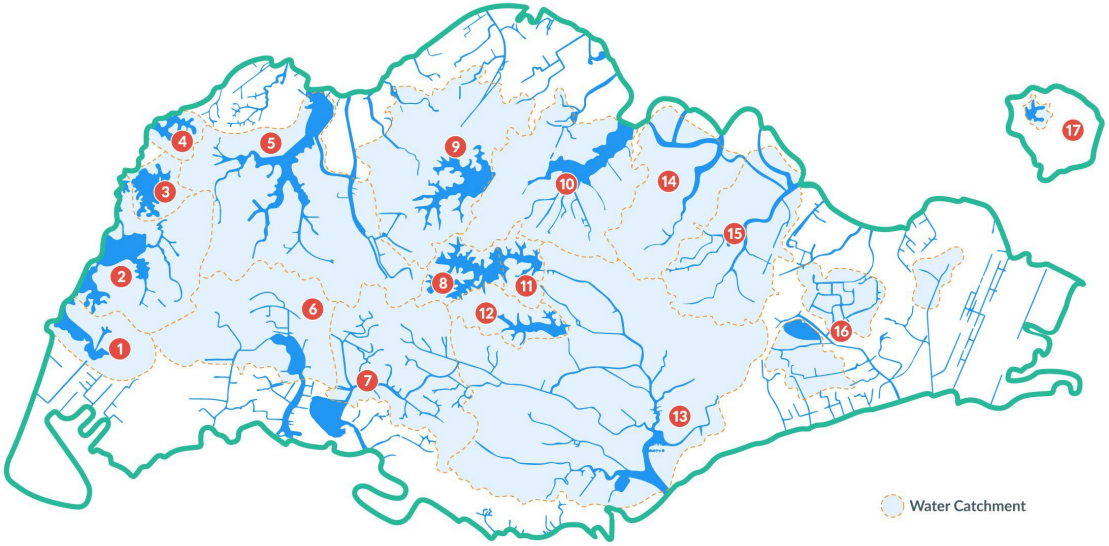
Urban water security challenges in Singapore

- Limited supply
  - Lack of natural water resources
  - Heavily dependent on rain and vulnerable to climate change
- Increasing water demand:
  - 430 million gallons a day or 782 Olympic-sized swimming pools
  - Expected to double by 2060



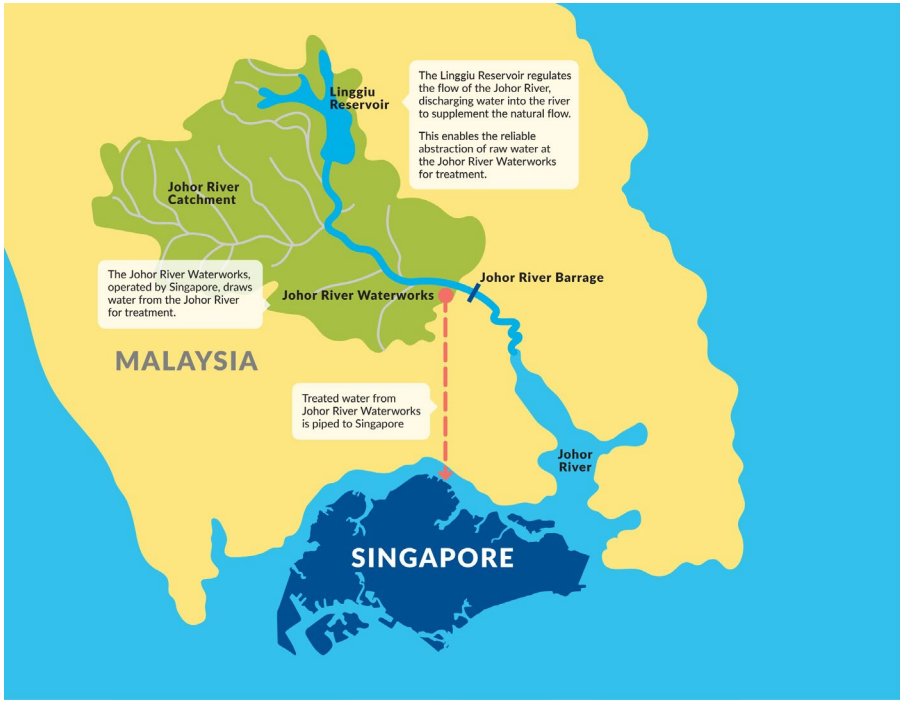
Source:https://www.pub.gov.sg/watersupply/fournationaltaps.

Increasing water catchment area: limited land space



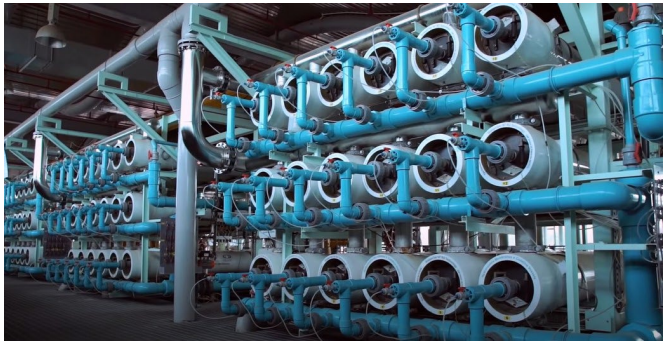
Source:https://www.pub.gov.sg/watersupply/fournationaltaps.

Imported water: political risk



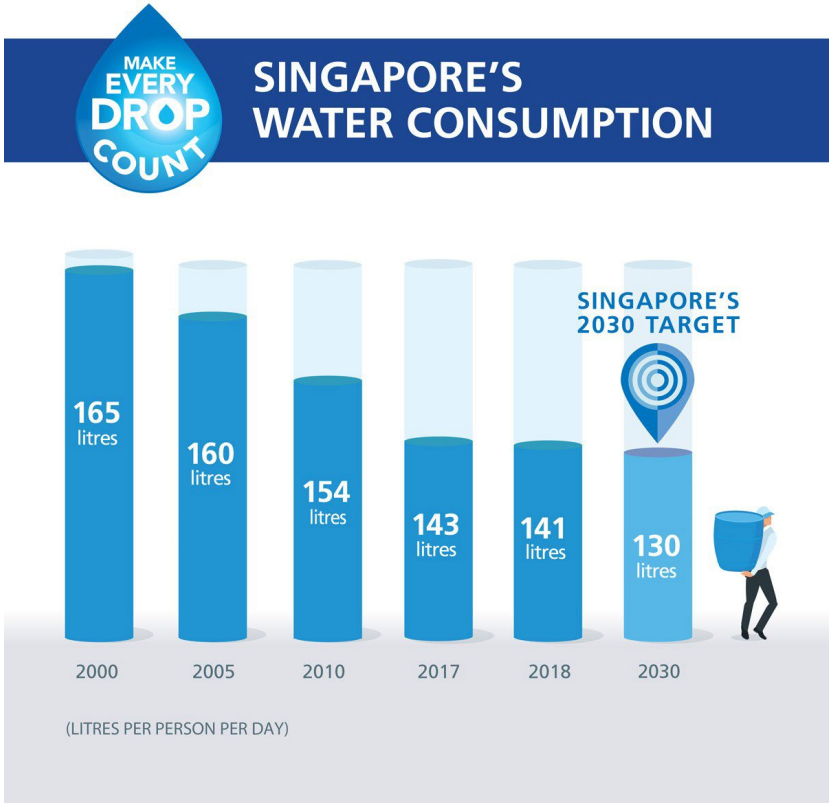
Source:https://www.pub.gov.sg/watersupply/fournationaltaps.

Water recycling (NEWater) and desalination: expensive



Source:https://www.pub.gov.sg/watersupply/fournationaltaps.

Demand management goal for residential water use:

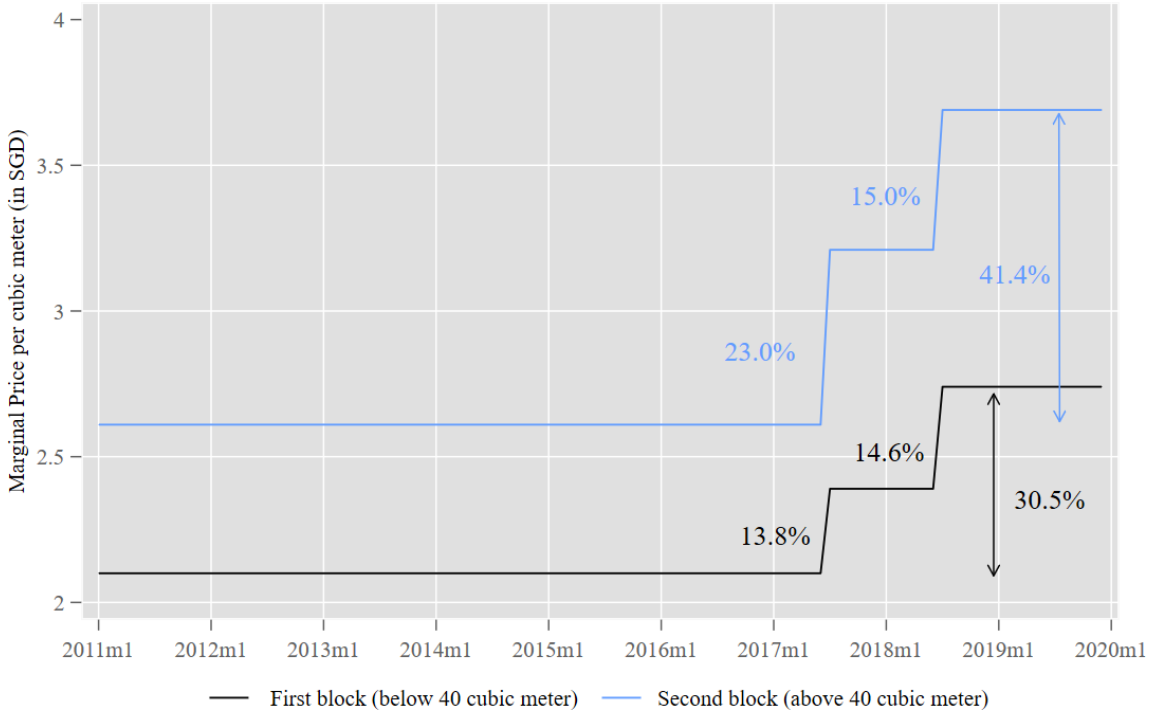


Source:https://www.pub.gov.sg/watersupply/singaporewaterstory

More

Back

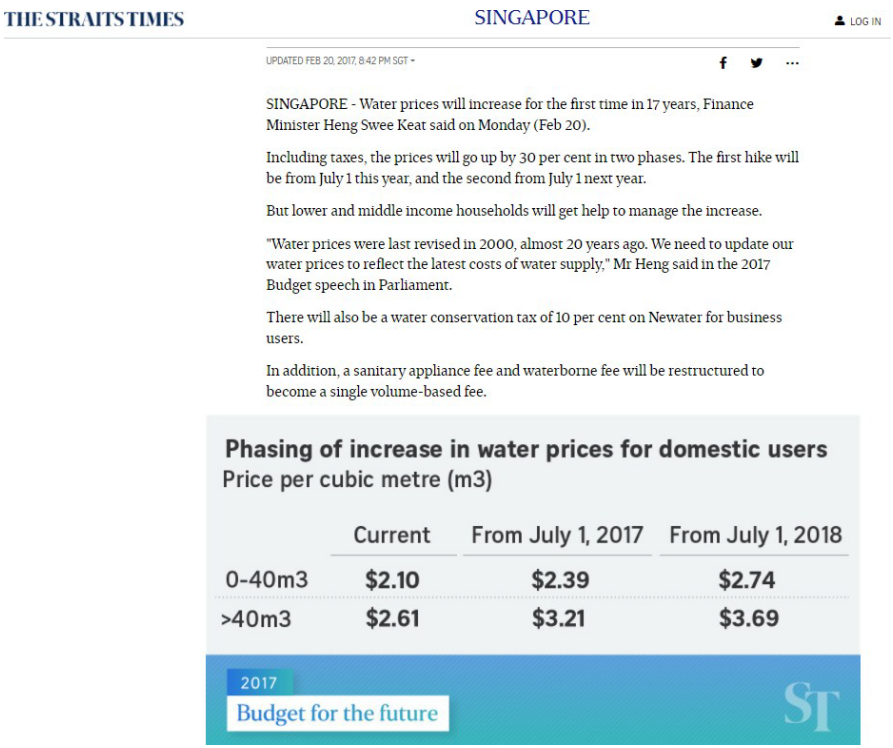
Water pricing:
Not changed for two decades Increasing block tariff



The announcement and implementation

Announced in February 2017 during budget speech

Major media coverage:



THE STRAITS TIMES SINGAPORE LOG IN

UPDATED FEB 20, 2017, 8:42 PM SGT

SINGAPORE - Water prices will increase for the first time in 17 years, Finance Minister Heng Swee Keat said on Monday (Feb 20).

Including taxes, the prices will go up by 30 per cent in two phases. The first hike will be from July 1 this year, and the second from July 1 next year.

But lower and middle income households will get help to manage the increase.

"Water prices were last revised in 2000, almost 20 years ago. We need to update our water prices to reflect the latest costs of water supply," Mr Heng said in the 2017 Budget speech in Parliament.

There will also be a water conservation tax of 10 per cent on Newater for business users.

In addition, a sanitary appliance fee and waterborne fee will be restructured to become a single volume-based fee.

Phasing of increase in water prices for domestic users

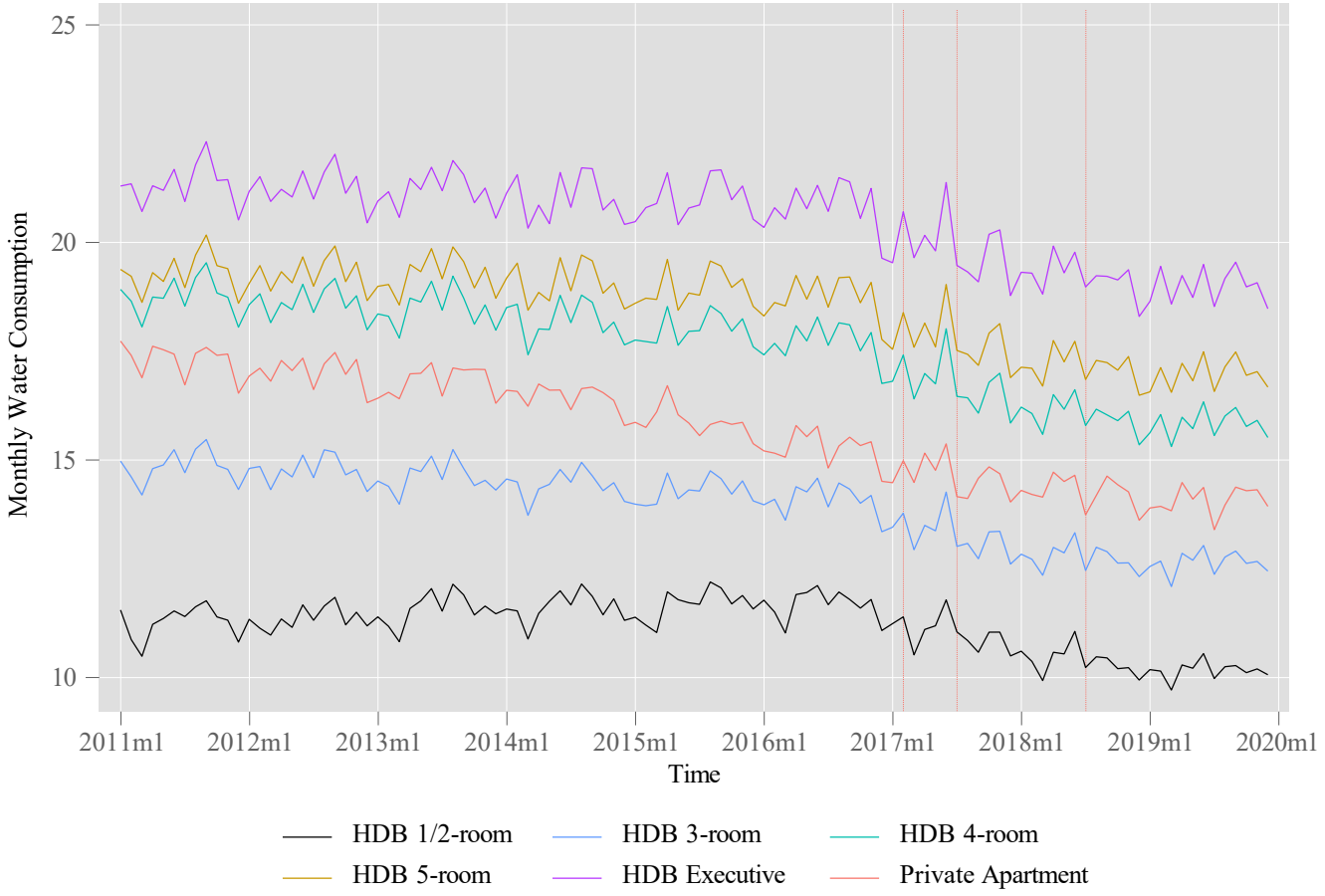
Price per cubic metre (m3)

	Current	From July 1, 2017	From July 1, 2018
0-40m3	$2.10	$2.39	$2.74
>40m3	$2.61	$3.21	$3.69

2017 Budget for the future ST

Source:https://www.straitstimes.com/singapore/singapore-budget-2017-water-prices-to-increase-by-30-from-july-1-in-two-phases.

Water consumption drops for HDB flats:



Do consumers respond to price chages?

Results:

Dependent variable:	(1) Log of water consumption	(2) Log of water consumption
Pre*HDB	-0.007	-0.007
	(0.006)	(0.006)
Post*HDB	-0.058***	-0.037***
	(0.006)	(0.008)
Post first price increase*HDB		-0.021***
		(0.008)
Post second price increase*HDB		-0.028***
		(0.007)
Group time trend	Yes	Yes
Account FE	Yes	Yes
Year-month FE	Yes	Yes
N	56,953,157	56,953,157
R^2	0.773	0.773

Robustness: Alternative specification, sample period and functional form.

See Appendix

Demand management:

- Efficiency improvements
- Nudging
- Education and Community Engagement

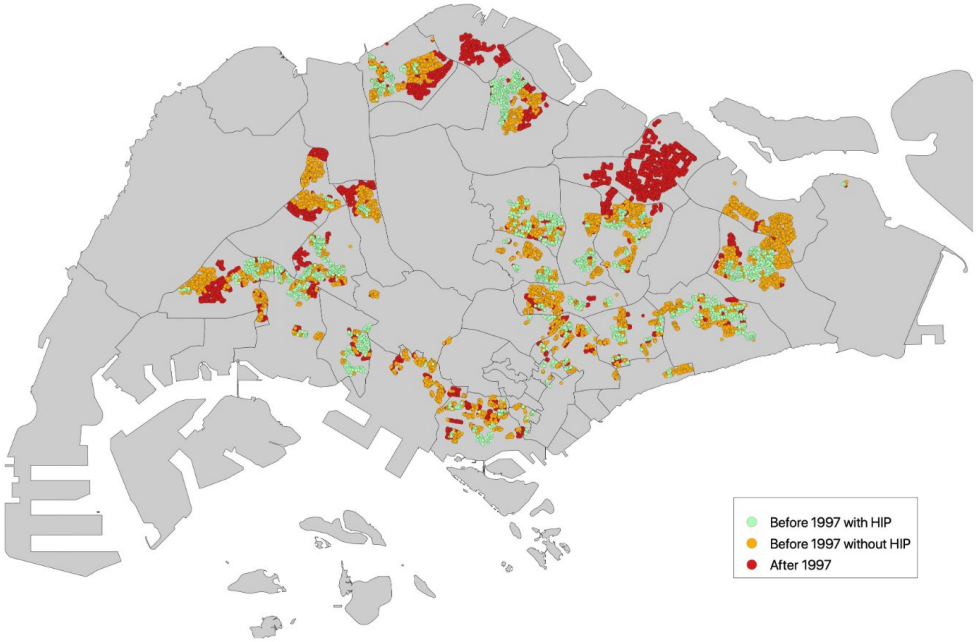
Background

Fixing the Plumb

CAN IMPROVING PLUMBING ALONE GENERATES LONG-LASTING EFFECTS IN WATER CONSERVATION[1]?

- Home Improvement Programme (HIP) in Singapore
  - Offering heavily subsidized replacement of sanitary fittings
  - Include both essential and optional improvements
- Staggered D-I-D
  - First target flats built before 1986 and later expanded to flat build before 1997
  - Account for both time-invariant household demographics and economic shock

Distribution of HDB blocks by HIP year

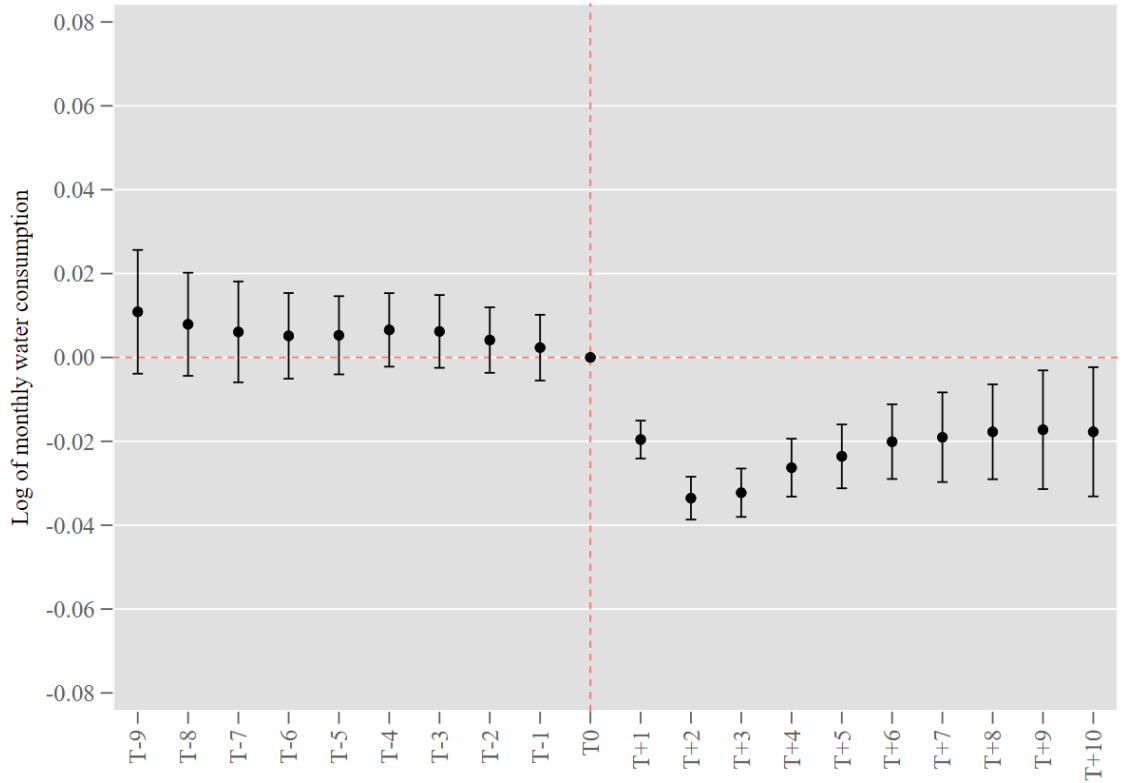


1. Agarwal, S., Araral, E., Fan, M., Qin, Y., & Zheng, H. (2021). Plumbing vs Nudging: The Lasting Effect of Efficiency Improvements on Water Conservation. forthcoming Nature Human Behavior..

Fixing the Plumb

Efficiency improvement under HIP:

- A reduction in residential water use by 3.5%
- The effect is persistent and lasts at least a decade
- Efficiency improvement helps mitigate the effect of extreme weather conditions on water use



Upon completing HIP, treated households reduce their water consumption by 3.5%

	(1)	(2)	(3)	(4)
Dependent variable:	Log of water consumption			
HIP*Completed	-0.035***	-0.035***	-0.035***	-0.035***
	(0.002)	(0.002)	(0.002)	(0.002)
Weather control	Yes	Yes	No	Yes
Pollution control	Yes	Yes	No	Yes
Group time trend	Yes	Yes	Yes	Yes
Account FE	No	Yes	Yes	Yes
Block FE	Yes	No	No	No
Year-month FE	Yes	No	Yes	Yes
Year FE	No	Yes	No	No
Month FE	No	Yes	No	No
N	98,291,320	98,291,320	98,291,320	98,291,320
R^2	0.108	0.740	0.740	0.740

Negative Environmental Externality*

- Household may increase energy consumption to mitigate undesirable external conditions
  - Example: "self-protect" against construction noise by shutting off windows and doors and air conditioning indoor environment

- Test household electricity consumption response to construction activities on adjacent sites in Singapore
  - Due to the tropical climate in Singapore, 30% of electricity is consumed by air conditioners
  - As a densely-built urbanized city, new construction activities are a common part of the urban fabric

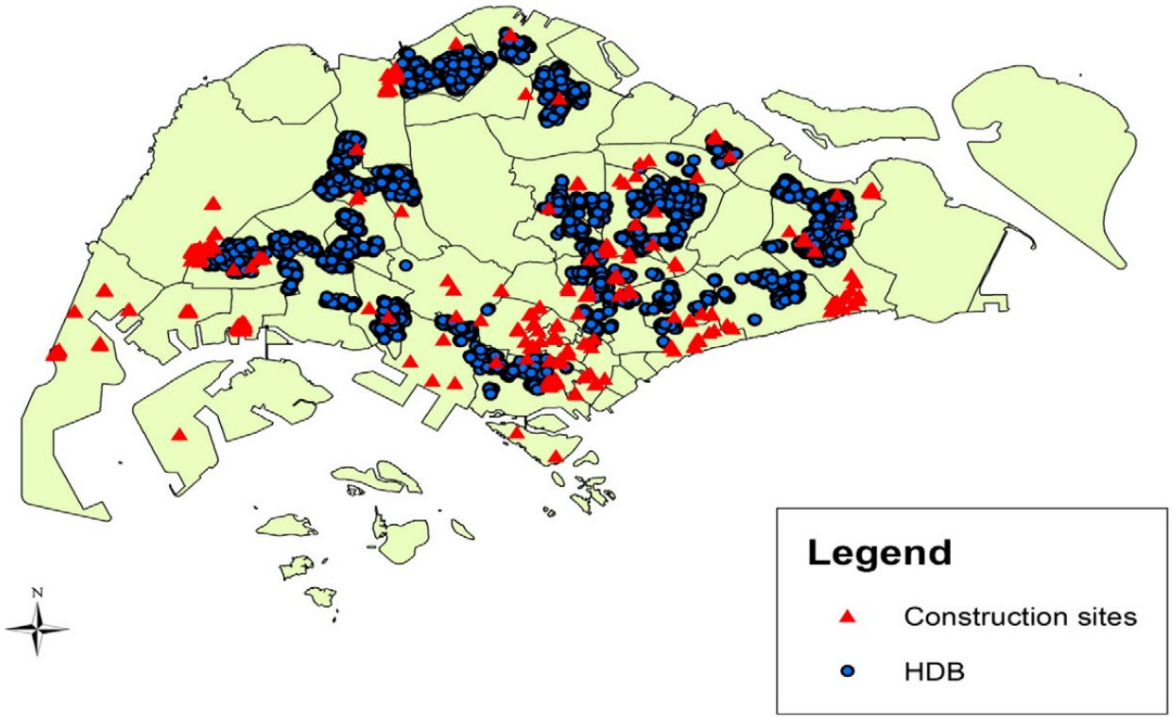
- Identification rests on
  - granular definition of the boundary of construction noise externalities - 1km radius
  - Exploiting the scale of construction projects that determines the noise level

*. Agarwal, S., Satyanarain, R., Sing, T. F., & Vollmer, D. (2016). Effects of construction activities on residential electricity consumption: Evidence from Singapore's public housing estates. Energy Economics, 55, 101-111..

Negative Environmental Externality

Negative externality cause a rise in electricity consumption:

- The estimated gap is an equivalent of 30.15 kWh per household and month
- The total monetary cost in the form of electricity tariff are estimated at S$15million for the treated households.
- The increase is persistent and does not rebound after project completion



Impact of Haze Pollution*

- Air pollution is one of the world's largest health and environmental problems
  - Its influences on economic outcomes has received considerable attention from economists

- Examine the causal effects of air pollution on household consumption of water and electricity in Singapore
  - Understanding the impact on utility demand is essential for the optimal design of utilities systems
  - Establish causality faces challenges (i.e. endogenous relation between pollution and human activities)

- Overcome the empirical challenges with
  - High-frequency utilities consumption
  - Exploiting the haze crises of Indonesia as random and exogenous shocks

* Agarwal, S., Sing, T. F., & Yang, Y. (2020). The impact of transboundary haze pollution on household utilities consumption. Energy Economics, 85, 104591.

Impact of Haze Pollution

- Indonesia's Fire Radiative Power (FRP) is statistically significant determinant of PSI readings in Singapore, which is associated with an increase of water and electricity consumption

- Can explained by the households' risk avoidance and risk mitigation behaviors
  - The elevated nighttime water consumption
  - The reduced their exposure to air pollution risks by staying indoors

- Consumption levels remained high for two months after a **long-term** haze episode, while the households reverted to their original consumption behaviours one week after a **short-term** haze shock

Sea Level Rise and House Prices

- Sea level rise (SLR) risks
  - A global threat attracting increasing attention and studies.
  - The global mean sea level could rise between 0.43 m and 0.84 m (up to 1.1 m) by the end of this century, relative to 1986-2005. (IPCC)
  - There is a 680 million population living in the low-lying coastal areas, which will exceed 1 billion by 2050.

Sea Level Rise and House Prices

- Residential real estate
  - Essential asset for most households (approximately 42% of households' total assets in Singapore).
  - Large transaction volume and sensitive to information.
  - Long-lasting properties are vulnerable to the long-term risks of climate change and sea level rise (SLR).

Background

- Government commitments
  - The PM discussed the measures to tackle climate change and sea level rise.
  - In the City area, the government tends to build another pump house at the Marina Barrage.
  - Construct polders or other alternative measures like reclaiming more islands offshore in the East Coast area.
  - Invest 100 billion S$ (74 billion USD) over 100 years.

Data and Empirical Strategy

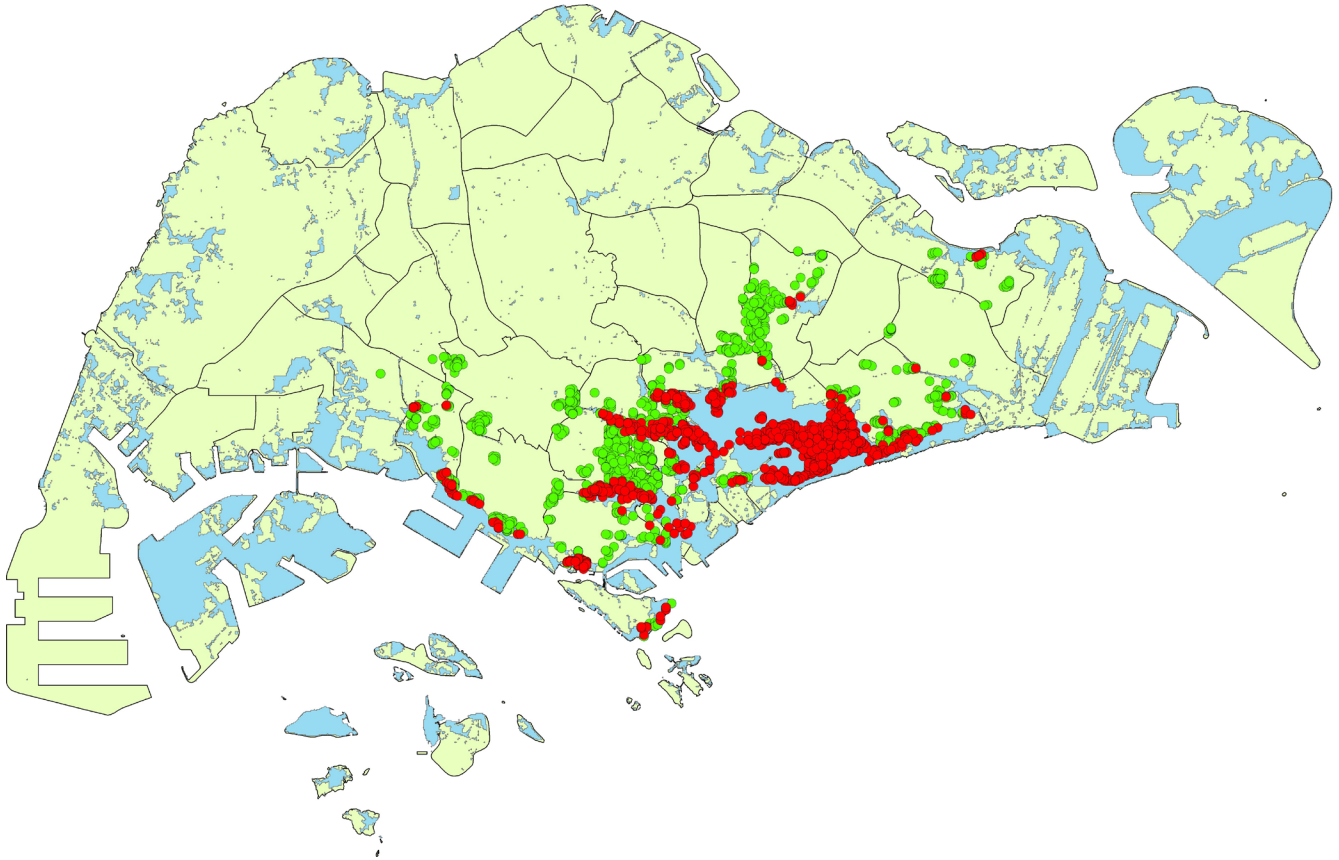


Figure 5A: Digitized map and private property transactions

Results

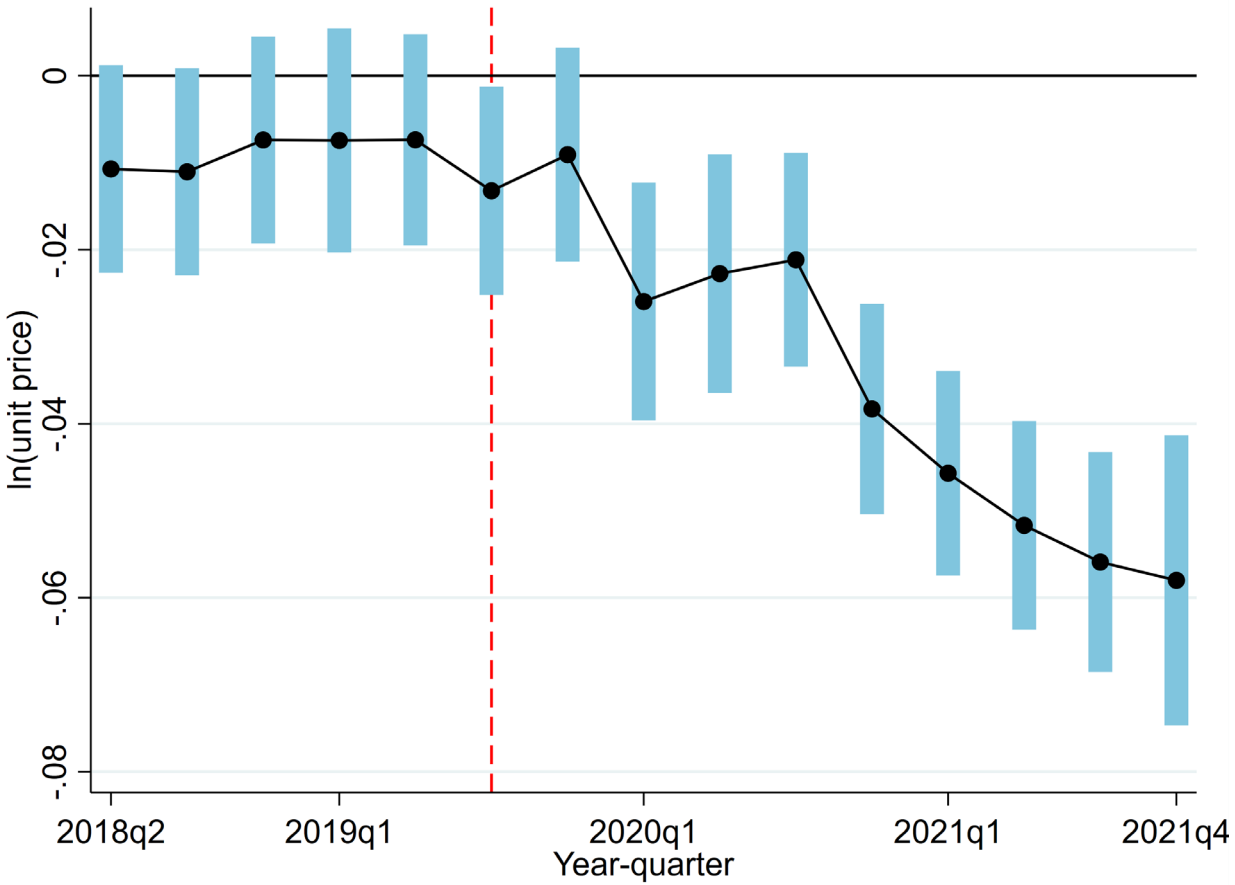


Figure 6C: Event studies (HDB, SLR risks effect)

Results

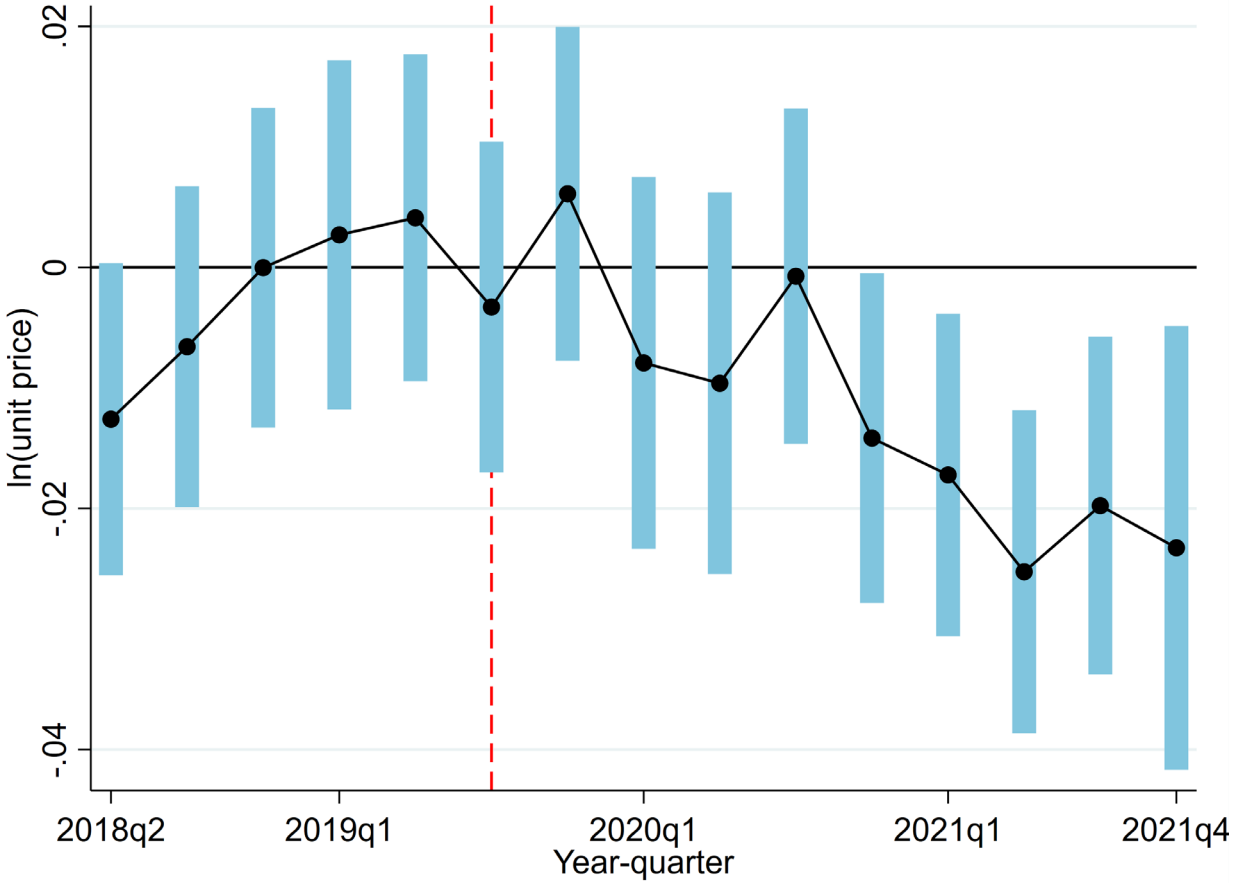


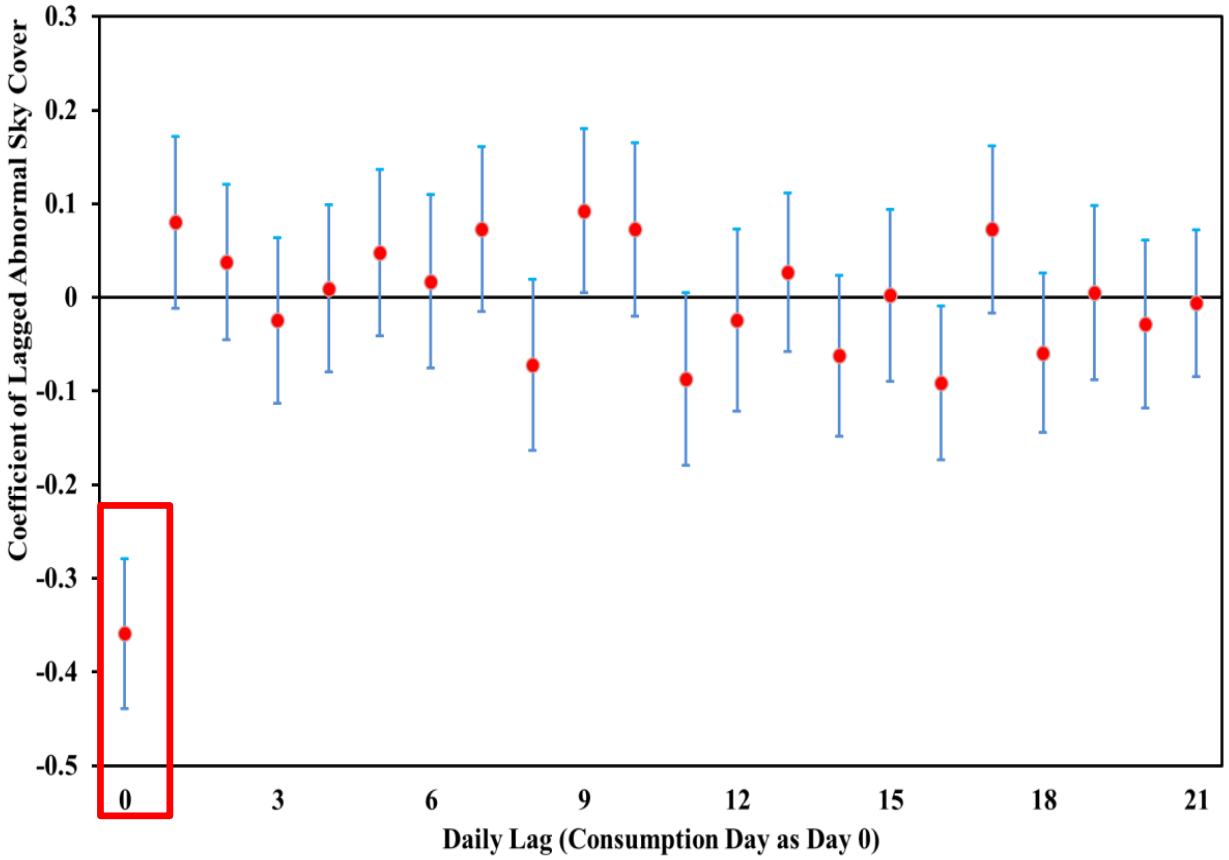
Figure 6D: Event studies (HDB, mitigation effect)

Environmental Sustainability - Weather

- Temperature and Morbidity(Agarwal et al., 2021)
  - A 7.3% increase in hospital admissions on days on which the average temperature is above 27 C
  - An additional hot day nationwide is associated with 0.3 billion US dollars increase in medical expenses

- Sunshine and Consumption(Agarwal et al., 2020)
  - A one-unit increase in the same-day local abnormal sunshine
  - The effect manifests in long-term, durable goods spending, and is not driven by other weather conditions

Sunshine and Consumption*



* Agarwal, S., Chomsisengphet, S., Meier, S., & Zou, X. (2020). In the mood to consume: Effect of sunshine on credit card spending. *Journal of Banking & Finance*, *121*, 105960.

Clune et al. (2017), Systematic review of greenhouse gas emissions for different fresh food categories

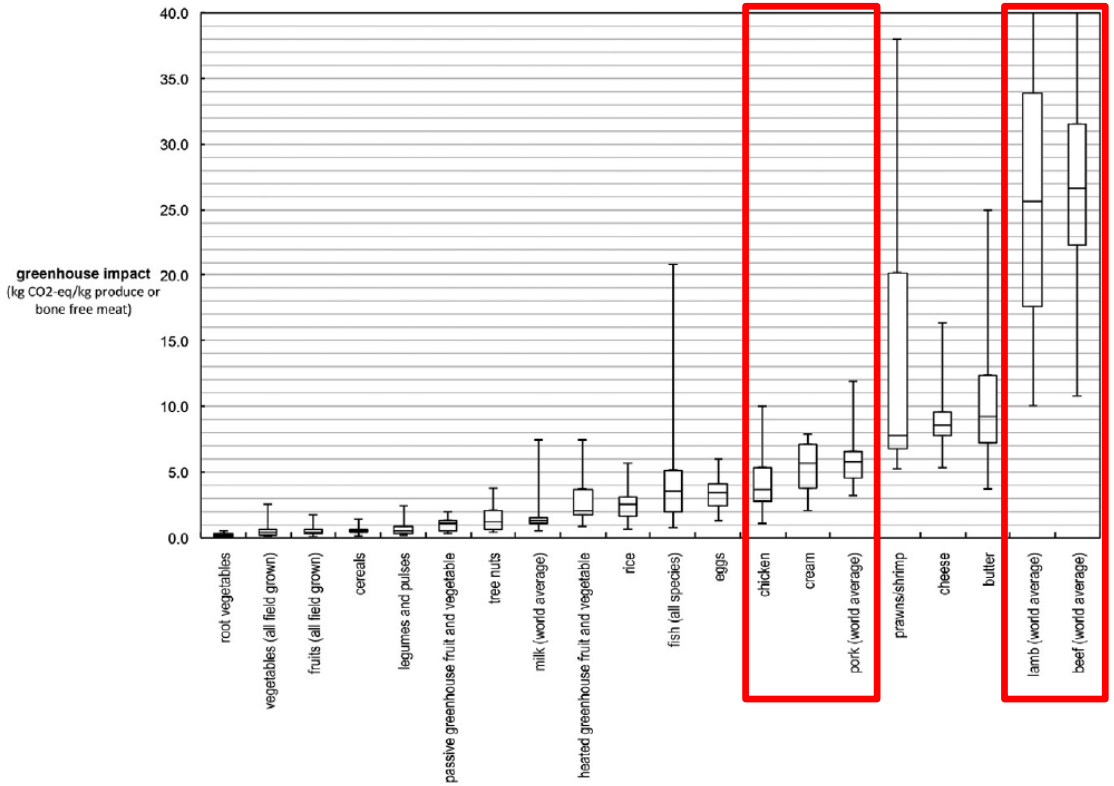
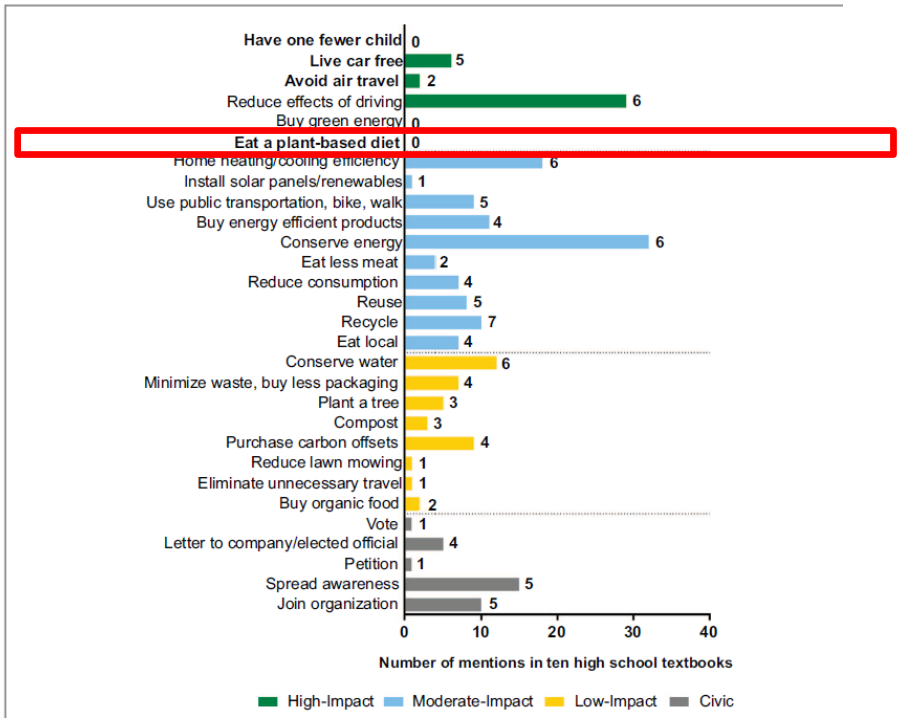
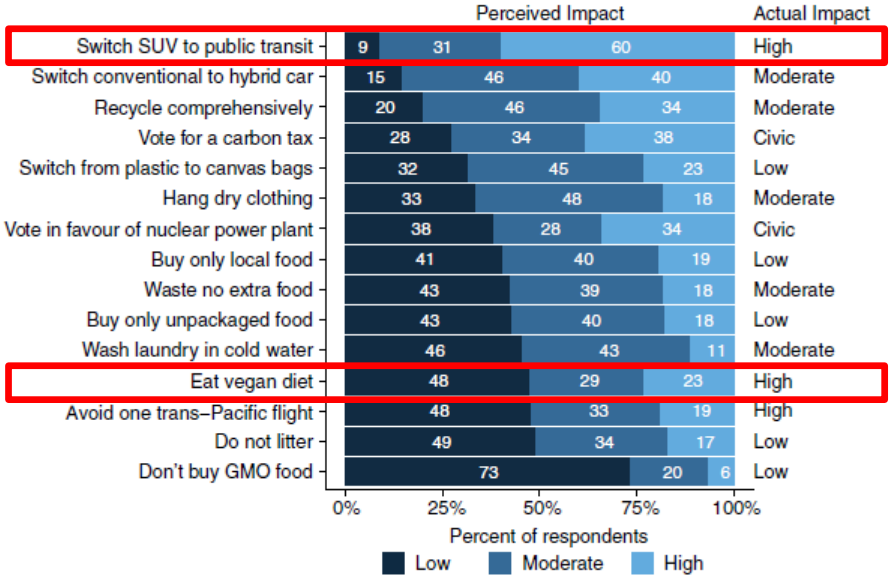


Fig. 5. Summary of GWP values (kg CO_2-eq/kg produce or bone free meat) across broad food categories.

Wynes et al. (2017), The climate mitigation gap: education and government recommendations miss the most effective individual actions



Wynes et al. (2019), How well do people understand the climate impact of individual actions?



Truelove et al. (2012), Perceptions of behaviors that cause and mitigate global warming and intentions to perform these behaviors

Table 2
Mean impact ratings of behaviors that contribute to global warming in closed ended questions.

Behavior	Mean	SD
Driving your car	7.79	2.25
Throwing away recyclable materials	6.83	2.57
Flying in airplanes	6.47	2.46
Heating and cooling your house	5.97	2.41
Littering[a]	5.83	2.84
Using aerosol cans	5.75	2.57
Lighting in your house	5.51	2.48
Using paper	5.43	2.53
Heating water for the shower and laundry	5.29	2.62
Using the dishwasher	5.27	2.64
Using electronic devices	5.14	2.54
Having children	4.55	2.74
Eating meat	3.83	2.52
Purchasing items that are tested on animals[a]	3.70	2.86
Riding your bike[a]	2.61	3.05
Skiing[a]	2.54	2.06

Note. Response scale for impact was 1 (Negligible impact) to 11 (Very major impact). *Ns* ranged from 109 to110.
[a] Behaviors that do not have a discernable impact on global warming.

US psychology majors, 43% Democrat (only 16% Republican)

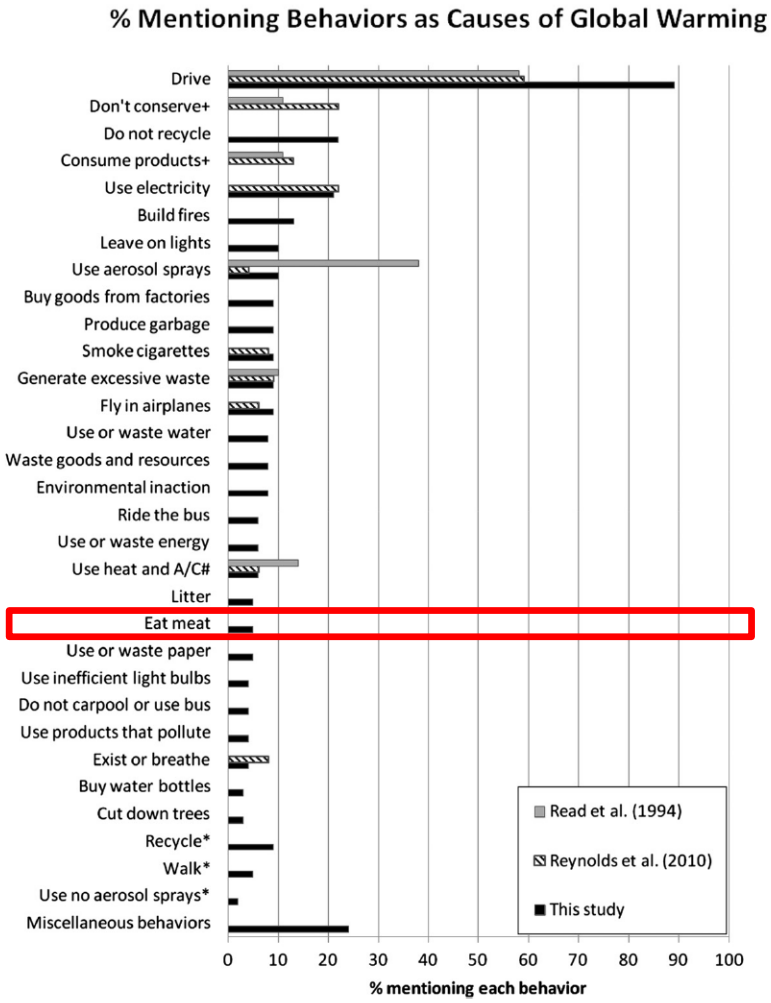


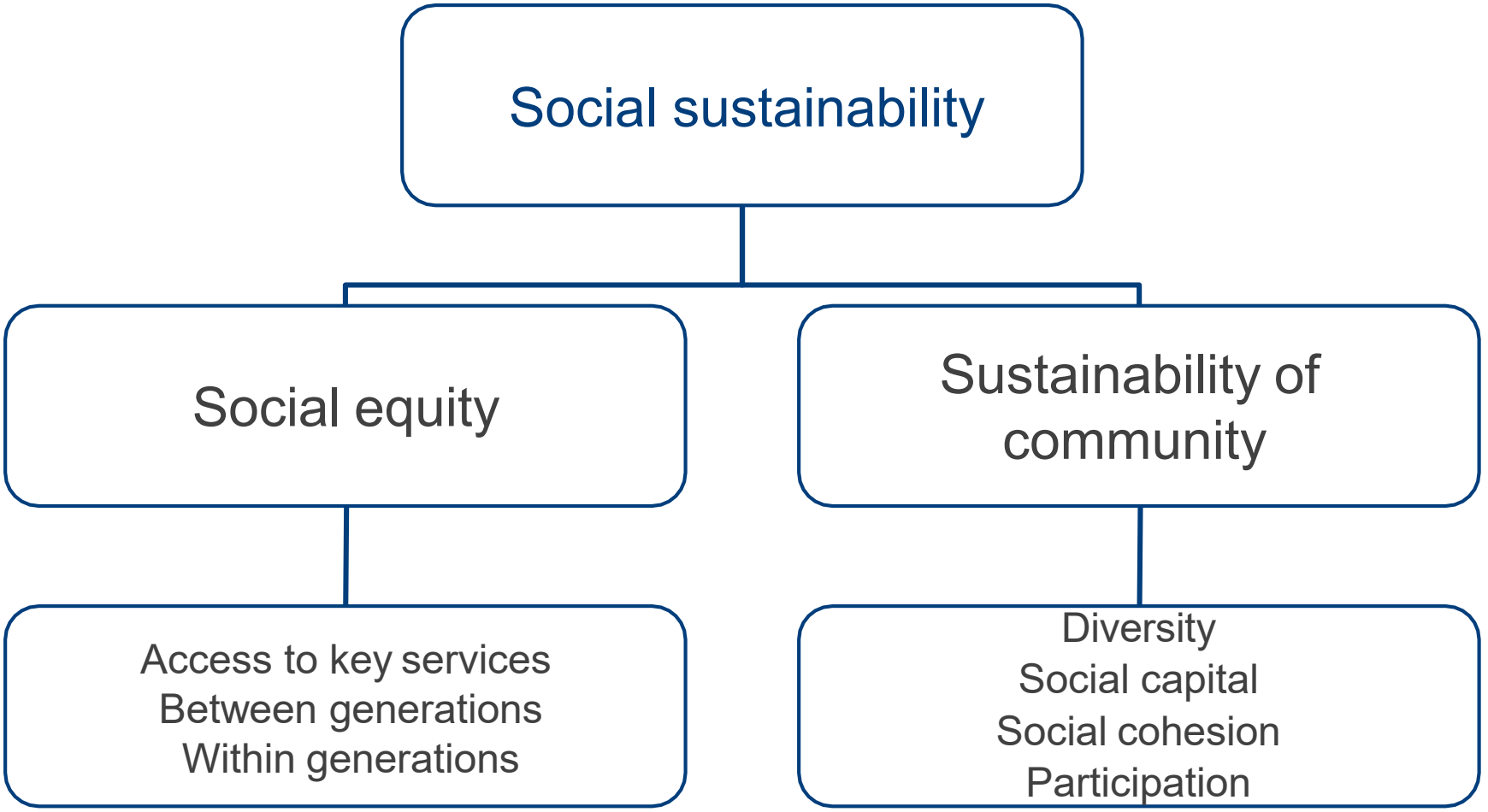
Fig. 1. Percentage of participants who listed each behavior as a behavior they perform that causes global warming in this study compared to Read et al. (1994) and Reynolds et al. (2010). Notes. For Read et al. (1994), only behaviors listed by at least 10% of participants were included and for Reynolds et al. (2010), only behaviors listed by at least 5% of participants were included. # Previous research coded only behaviors that use A/C. Behaviors that use A/C and heat were included in the current study. + Behavior that was coded with more specificity in this study compared to previous studies. * Behaviors that do not have a discernable impact on global warming.

Social Sustainability

Source: Key world energy Statistics, IEA

Planning for sustainability

- Social sustainability



Social sustainability

- Households do not live alone
- Households provide land, labor, and capital to the external economy, in exchange for incomes including rents, wages, interests, and profits; the incomes are then utilized to buy goods and services from the external economy again, rendering an income flow circular
  - Households and external social economy interact and affect each other
  - The interactions between household and external social economy generates implications for social sustainability

Motivation – Menstrual Hygiene, Period Poverty and Stigma

Period Poverty, Stigma Are Keeping Girls Out of School

Investing in menstrual hygiene management (MHM) can help get girls back in school.

By Phineas Rueckert
May 30, 2018

Why India must battle the shame of period stain

THE CITIZEN BUREAU | 31 MAY, 2016

Menstruation Keeps Girls From School: In India 20% Drop Out Reaching Puberty

UNITED NATIONS(IPS): Around the world girls are struggling to stay in school when their menstrual hygiene needs are forgotten or ignored, yet the water, sanitation and hygiene d education sectors have remained reluctant to address the issue.

1. Only 36 Percent Women Use Sanitary Pads In India

National Family Health Survey 2015-2016 estimates that of the 336 million

5. Menstruation And Impact On Education

A 2014 report by the NGO Dasra titled 'Spot On!' informed that almost 23 million girls in India drop out of school annually, because of lack of menstrual hygiene management facilities, including availability of sanitary napkins and awareness about menstruation. The report further suggests that the girls, who don't drop out, usually miss up to 5 days of school every month.

https://www.globalcitizen.org/en/content/menstrual-hygiene-day-education/#:~:text=Apart%20from%20the%20cost%20of,after%20they%20get%20their%20periods.
https://www.bbc.com/news/world-asia-india-52830427
https://www.thecitizen.in/index.php/en/newsdetail/index/7/7836/menstruation-keeps-girls-from-school-in-india-20-drop-out-reaching-puberty#:~:text=In%20Nepal%20and%20Afghanistan%2C%2050,school%20completely%20after%20reaching%20puberty.

Motivation – Free Sanitary Pads in California and England

- **California**

The Washington Post
Democracy Dies in Darkness

A worker at Compton's Market in Sacramento restocks tampons. (Rich Pedroncelli/AP)

By Bryan Pietsch

October 10, 2021 at 3:24 a.m. EDT

Period products will be provided free in public schools across California starting next school year as required by new legislation signed into law on Friday.

Public schools with students in grades six to 12, community colleges and the California State University System — a network of 23 campuses with more than 485,00 students — will be required to provide free period products in restrooms starting in the 2022-2023 academic year.

The legislation, named the Menstrual Equity for All Act, was introduced by Cristina Garcia (D), a member of California's State Assembly, and signed into law by Gov. Gavin Newsom (D).

[1 in 10 college women face period poverty, a study shows. Here's what that means.]

The law is the latest step toward "menstrual equity" in the nation's most populous state, which has a history of implementing laws that are later echoed in other parts of the country. This year it also eliminated a tax on menstrual products (also led by Garcia), which Garcia said in a statement costs Californians more than $20 million annually.

https://www.washingtonpost.com/nation/2021/10/10/california-menstrual-products-period-law/

- **England**

Free period products to be available in schools and colleges in England

State scheme starts from Monday as part of government bid to tackle 'period poverty'

The scheme will apply to 20,000 primary and secondary schools, and colleges. Photograph: lovethephoto/Alamy Stock Photo/Alamy Stock Photo

Tampons, sanitary pads and other period products will be made freely available to all state schools and colleges in England starting next week, with the launch of a scheme funded by the Department for Education.

https://www.theguardian.com/education/2020/jan/18/free-period-products-to-be-available-in-schools-and-colleges-in-england

Motivation

- Globally, 500 million women and girls lack access to menstrual hygiene products.
  - According to UNICEF, poor menstrual hygiene poses high physical health risks.
  - Anecdotal evidence suggests that **poor menstrual hygiene management** and **denied access to menstrual hygiene supplies** are the major barriers to girls' education.
  - In India, girls are absent for 20 percent of the school year due to menstruation, and 23 million girls drop out of school annually due to menstruation-related difficulties.
  - In US, survey reports that one in five girls have missed schools due to lack of access to sanitary products.
- Empirical evidence is limited
  - Toilet/Road Construction:
    - Adukia, AER 2016: construction of toilets in 2003-2005 improves enrollment
    - Adukia, Asher and Novosad, AEJ 2020: construction of roads improves enrollment and test scores
  - Distribution of Sanitary Products:
    - Oster and Thorton, AEJ 2011: RCT Distribution of menstrual cups in Nepal
    - Phillips-Howard et al., BMJ 2016: RCT Distribution of menstrual cups and pads in Kenya

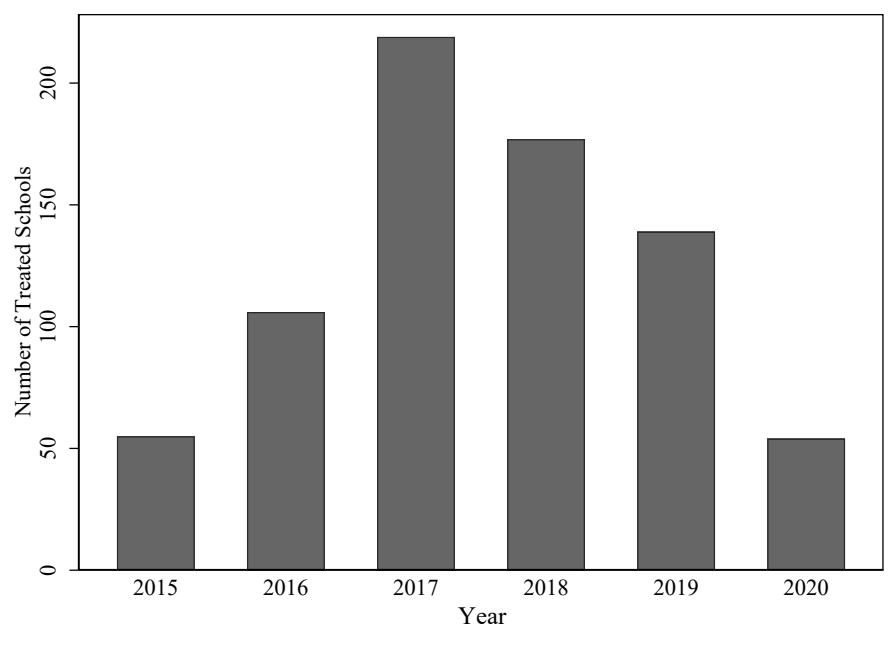
Program Description

- **SHE Pad Scheme**
  - Large-scale program initiated by the state government of Kerala to provide free sanitary pads to all girl students across the state.
  - Pilot program was first implemented in 2015, and officially implemented state-wide in 2017.
  - Installation of Sanitary Pad Vending Machines that distribute free and quality-safety sanitary pads.
  - Sanitary pads are supplied in regular terms to schools by a state-owned enterprise, based on the number of menstruating female students in every school.
  - The collection of sanitary pads is regulated, monitored and recorded by an appointed school counselor. The records are inspected by an appointed government official.

https://www.indiatimes.com/news/india/in-a-first-kerala-makes-sanitary-napkin-vending-machines-mandatory-in-all-schools-321966.html

Program Description

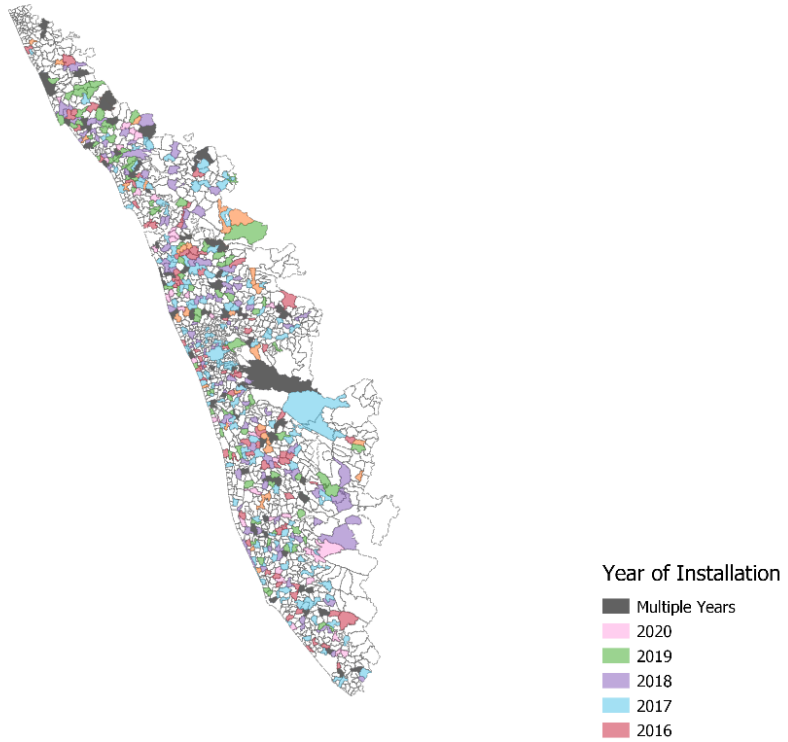
Figure: Number of Schools Installed with Sanitary Pad Vending Machines, by Year



765 treated schools

Program Description

Figure: Geographical Distribution of Treated Villages, by Year



Data

- **Enrolment Data: District Information System Education (DISE)**
  - Academic years from 2013-2014 to 2019-2020
  - Covers every registered primary and secondary schools in Kerala, India
  - Variable: Student enrolment by gender and grade, examination completion and outcomes for terminal exams (Grade 4th and Grade 7th), and school infrastructure
- **Treatment Data: SHE Pad Scheme**
  - Variable: school name, district name, school type, name of school headmaster and treatment details including the year of installation of sanitary pad vending machine and the average number of students utilizing the facility.
- **Final dataset: 17896 schools**
  - 5,080 lower primary schools (grades 1st through 4th)
  - 7,363 upper primary schools (grades 5th through 7th)
  - 2,062 secondary schools (grades 8th through 12th)
  - The remaining are all-through schools that combine at least two sections

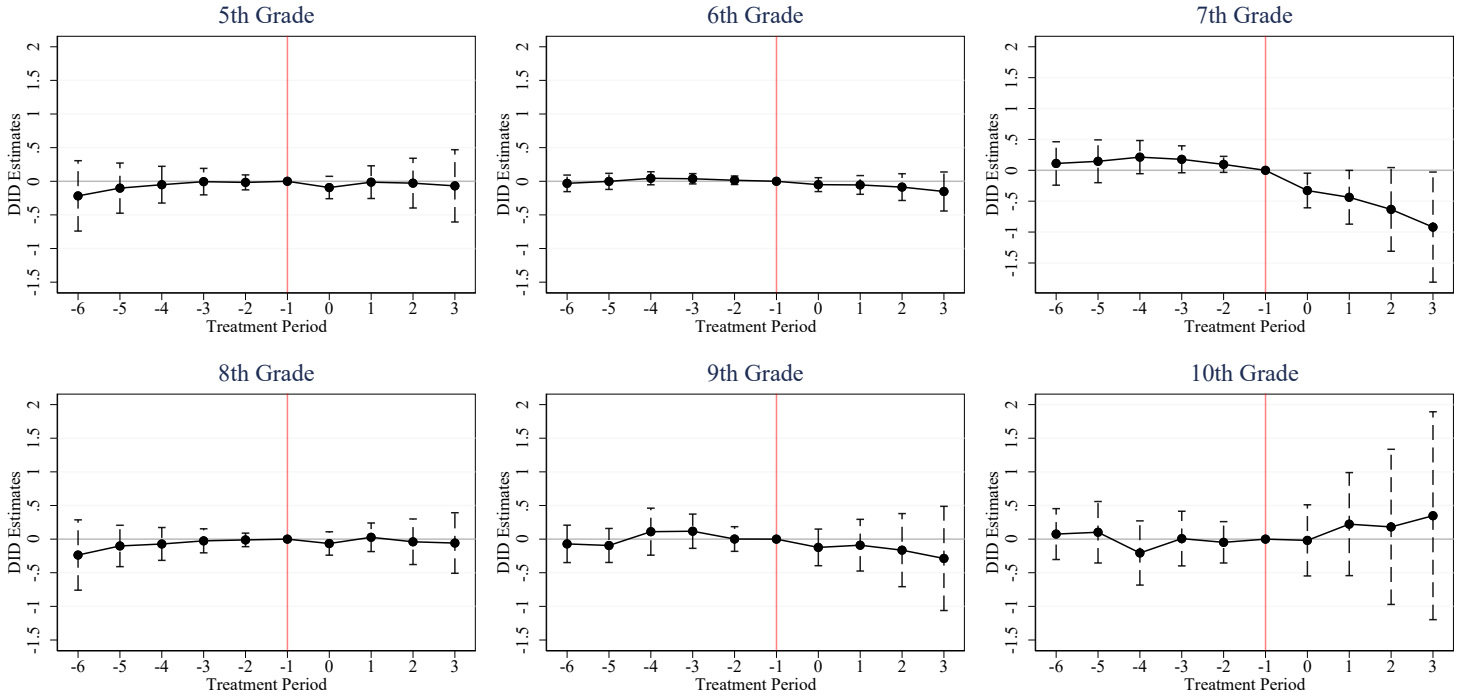
Baseline Results – Student Dropout

Table: Average Effects on the Dropout Rate of Girls

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dropout Rate of Girls across Grades						
	5th Grade Age 10-11	6th Grade Age 11-12	7th Grade Age 12-13	8th Grade Age 13-14	9th Grade Age 14-15	10th Grade Age 15-16
AfterT	-0.101	-0.033	-0.240**	-0.074	-0.079	-0.045
	(0.065)	(0.044)	(0.115)	(0.065)	(0.109)	(0.217)
R^2	0.430	0.341	0.574	0.366	0.415	0.736
Observations	39,546	39,024	20,484	22,836	21,804	13,848
Treated schools	496	504	494	689	687	640
Control schools	6,095	6,000	2,920	3,117	2,947	1,668

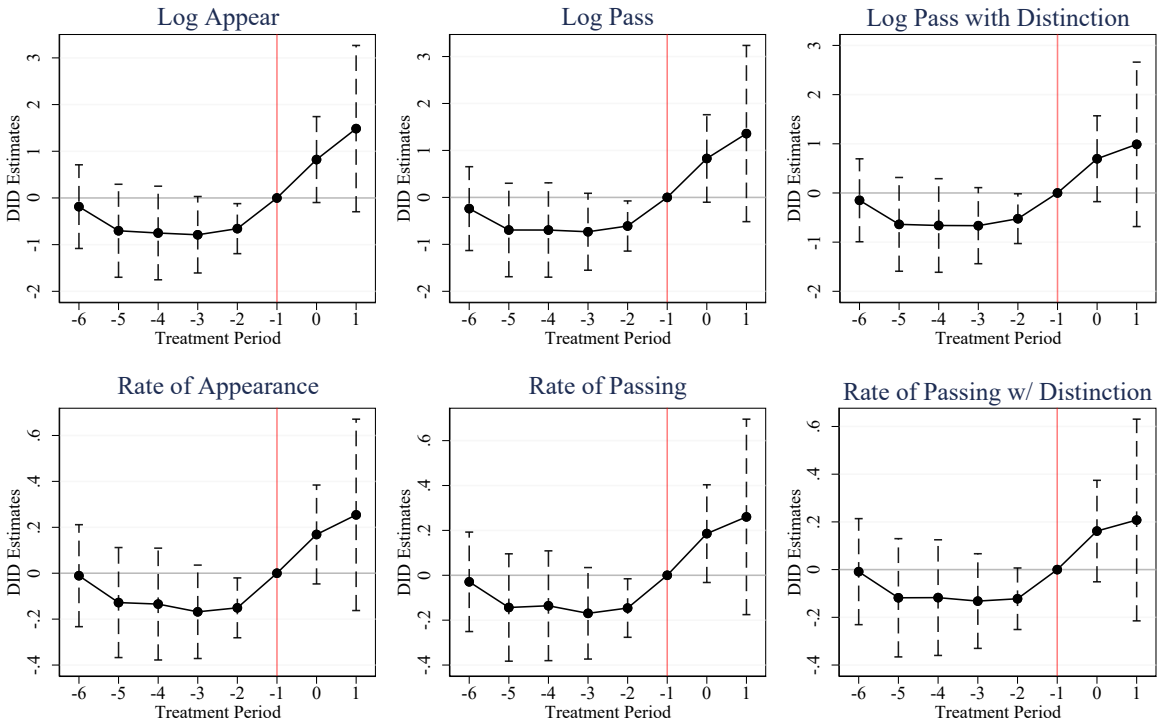
Baseline Results – Student Dropout

Figure: Dynamic Treatment Effects on the Dropout Rate of Girls in the 5th Grade to 10th Grade



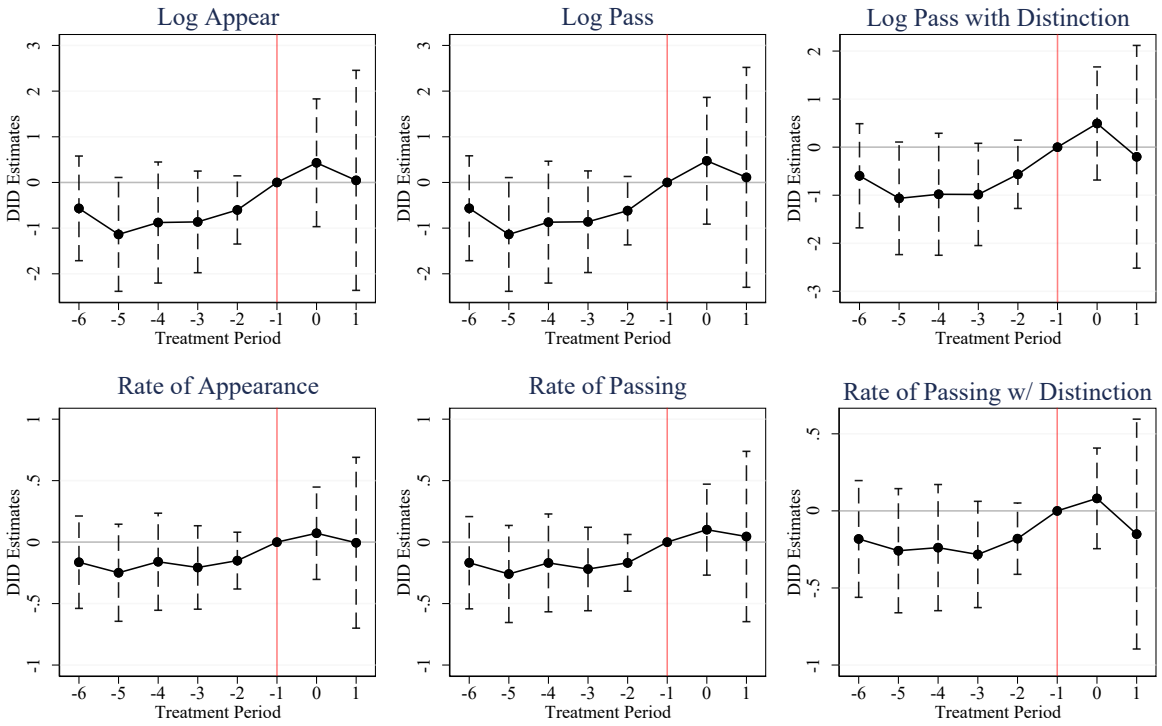
Results – Examination Outcomes 7th Grade Exam

Figure: Upper Primary School-Leaving Examination Outcomes (7th Grade Exam)



Results – Examination Outcomes 4th Grade Exam (No effects)

Figure: Lower Primary School-Leaving Examination Outcomes (4th Grade Exam)



Consumer and Firm Information

- Consumer awareness about **what they consume, where it comes from, who produced it, and how it was produced** has been gaining popularity (Keloharju, Knüpfer, and Linnainmaa, 2012; Huang, 2018).
  - Examples: **farm-to-table, QR codes** to track your product from the source of production to your house.
- This is mainly driven by consumers' concerns about corporate values, child labor, sustainability, governance and social responsibility (Dai, Liang, and Ng, 2021).
- Publicity of information about companies can affect consumer perceptions, as well as their behavior.

Institutional Background

- Administrative Penalty in China
  - Administrative Penalty Law, 1996
  - The administrative law essentially allows for administrative penalties to be issued against a company for breaches of corporate compliance.
  - Companies can face confiscation of illegally gained income or property, suspension of production or operations, provisionally suspending or revoking permits or licenses, and administrative detention such as criminal punishment or even prison.

Institutional Background

- The Publicity of Administrative Penalties
  - The Interim Provisions on the Publication of Information about Administrative Penalty Imposed by Administrative Authorities for Industry and Commerce, come into force on **October 1, 2014** (August 2014).
  - Information includes:
    - Party on which the administrative punishment is imposed
    - Type of the illegal act
    - Content of the administrative punishment
    - Title of the administrative authority making the administrative penalty decision
    - Date when the decision is made
  - Public **within 20 working days**. The publicity period is generally **five years**.

Data

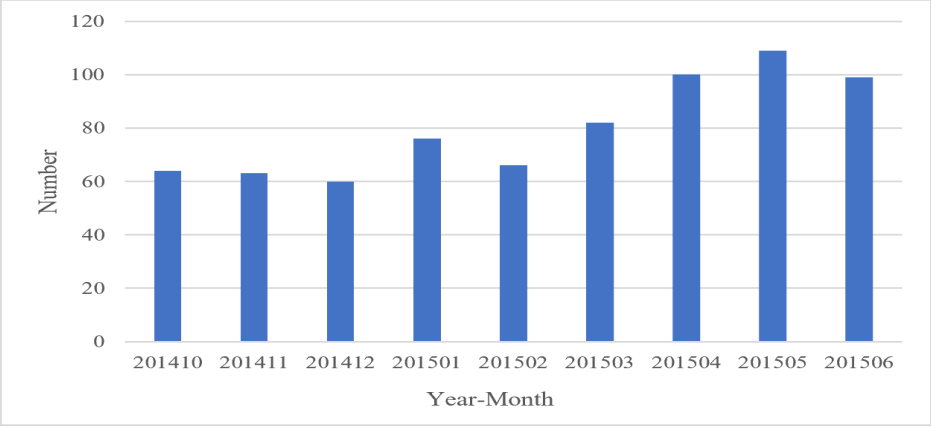
- Credit Card Spending Data
  - A leading bank – Large and representative sample
    - Account for 10% of China's credit card market
    - Covering consumers from all 31 provinces in China
    - Transaction level: amount, type, location, and **the exact merchant's name**
  - Rich demographics (random sample)
- Firm administrative penalty data
  - Full list since October 1, 2014 (to the end of 2020)
    - Information: decision date, the party on which the administrative penalty is imposed, reason, type of the illegal act, the extent and amount of the penalty, the administrative authority, detailed description.

Administrative Penalties

- Top 5 Penalty Types

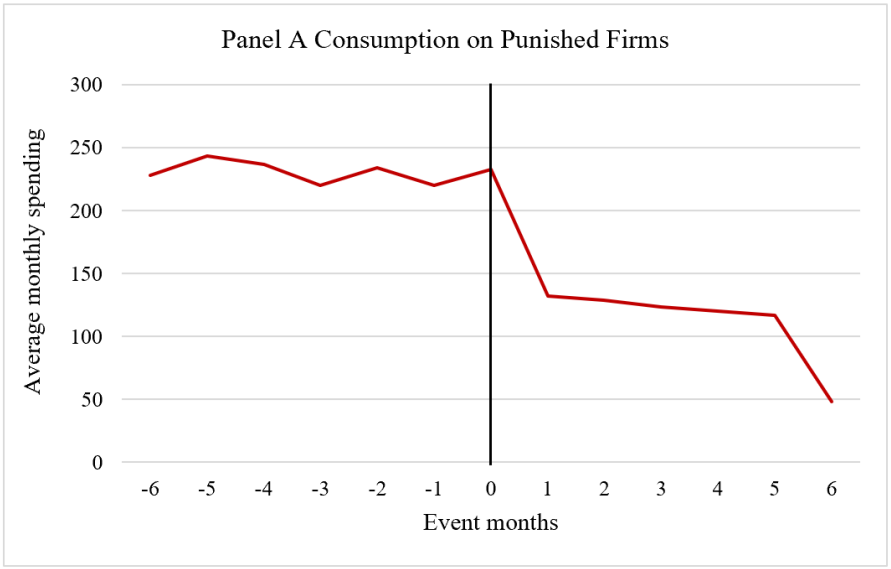
	Fraction (%)
Quality-related	39.54
Illegal operation-related	17.32
False advertising-related	11.54
Tax-related	9.09
Fire Safety-related	7.94

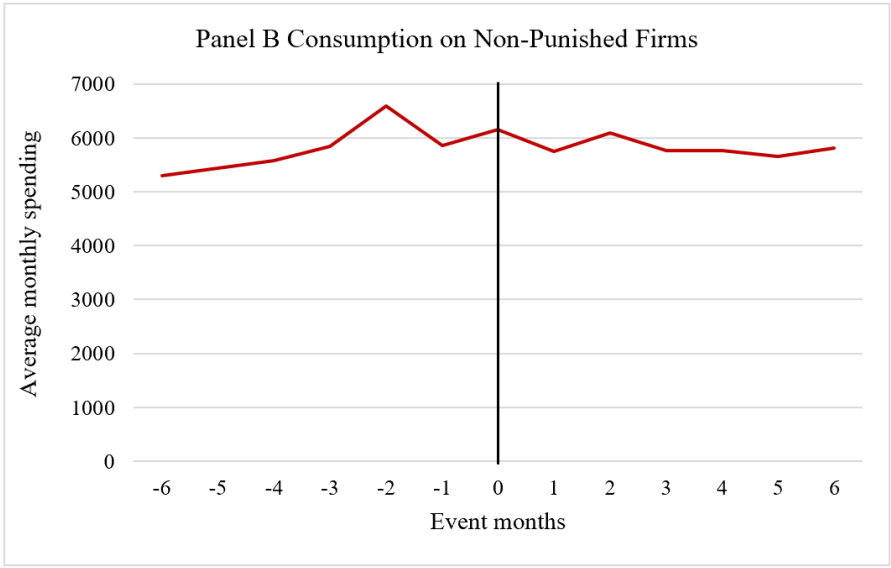
- Time of Publicity of Administrative Penalty



Unconditional Mean of Credit Card Spending Surrounding the Administrative Penalty

- Consumers with spending records on punished firms





The Average Spending Response

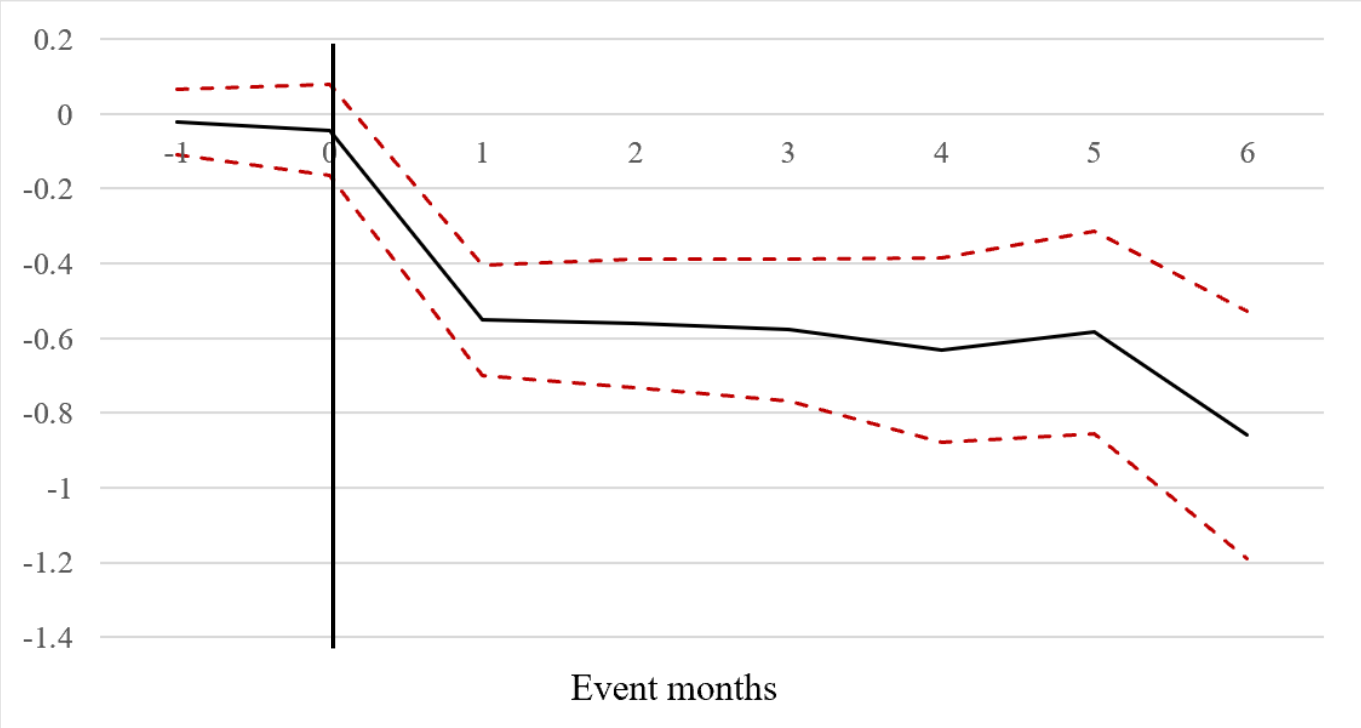
	Log (credit card spending on punished firms)		Log (credit card spending on non-punished firms)	
	(1)	(2)	(3)	4)
$1_{[-1m,-1m]}$	0.0525	0.0502	0.0314	0.0348
	(0.0468)	(0.0472)	(0.0383)	(0.0381)
$1_{[0m]}$	0.0566		0.0706	
	(0.0551)		(0.0440)	
$1_{[post]}$	-0.4162***	-0.4193***	-0.0886	-0.0841
	(0.0556)	(0.0541)	(0.0576)	(0.0568)
Constant	1.1677***	1.1689***	6.1583***	6.1516***
	(0.0293)	(0.0285)	(0.0306)	(0.0305)
Fixed Effects	Individual, Firm, Year-month			
# of individual	7195			
Observations	93,535	86,340	93,535	86,340
R-squared	0.2618	0.2749	0.3818	0.3825

- Consumers decreased spending on punished firms after the penalties.
- For the same consumers, there is no significant change in their spending on non-punished firms after the penalties.

Estimated Response Dynamics

- Estimate Equation:

$$Y_{it} = \delta_t + \gamma_f + \alpha_i + \sum_{s=-1}^{6} \beta_s \times 1_{month\ s} + \epsilon_{i,t}$$

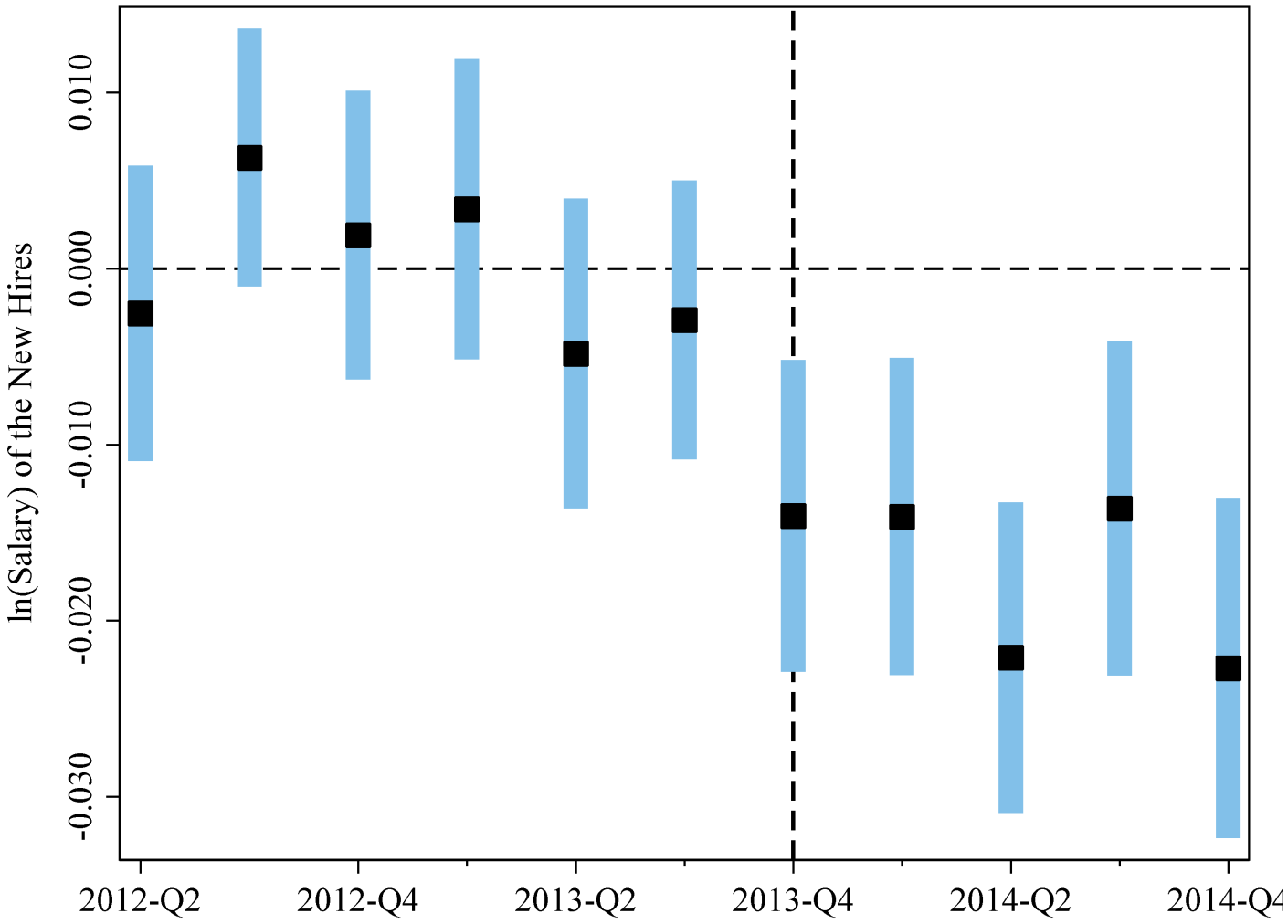


Heterogeneity: by Penalty Types

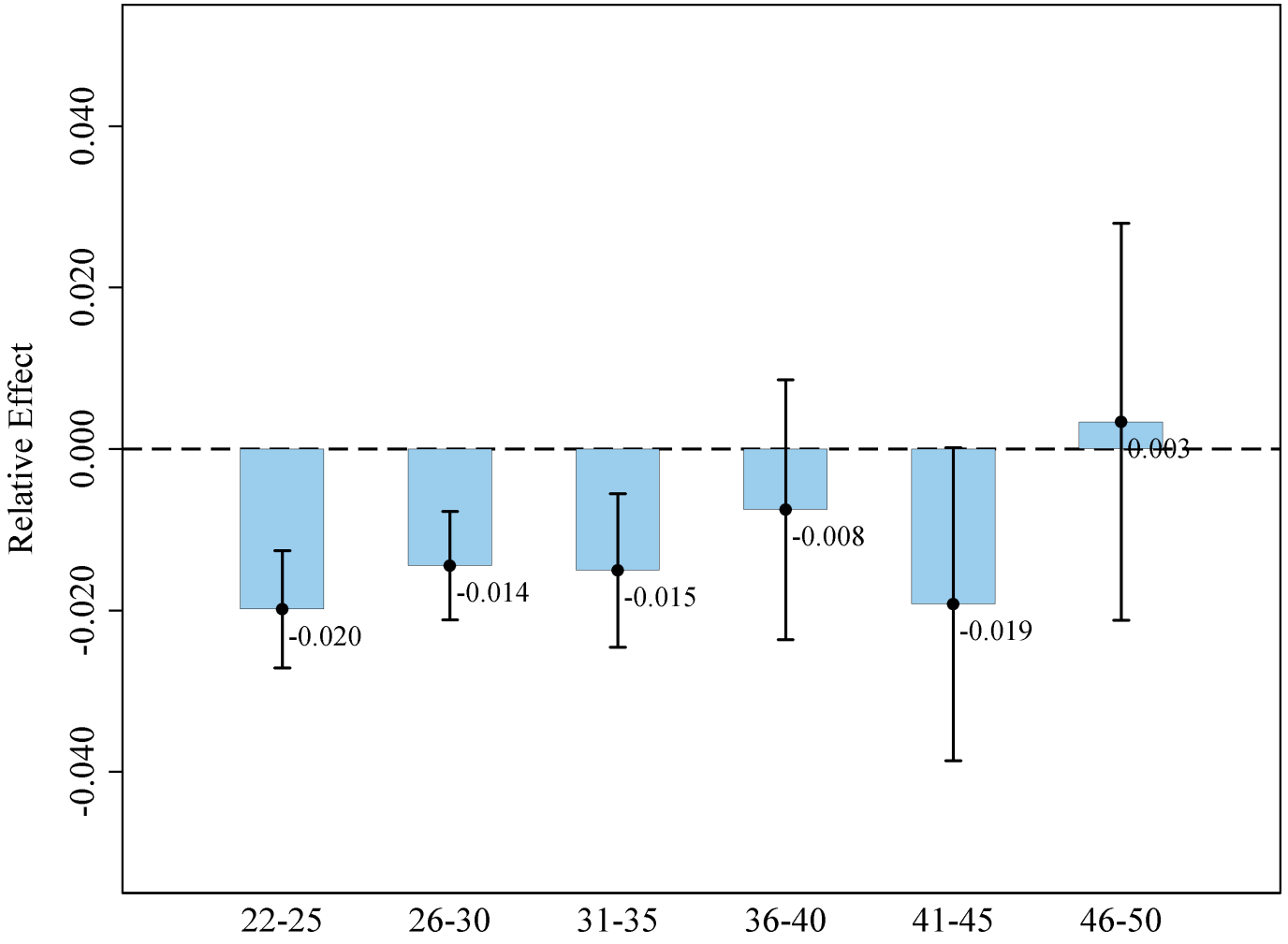
	Log (credit card spending on punished firms)				
	Quality	Illegal operation	False advertising	Tax	Fire safety
	(1)	(2)	(3)	(4)	(5)
$1_{[-1m,-1m]}$	0.0129	0.0288**	0.0126	0.0136	0.0001
	(0.0321)	(0.0125)	(0.0166)	(0.0139)	(0.0036)
$1_{[0m]}$	0.0696	0.0012	0.0234	0.0162	0.0086
	(0.0486)	(0.0150)	(0.0233)	(0.0190)	(0.0081)
$1_{[post]}$	-0.2541***	-0.0438***	-0.0215	-0.0184**	-0.0172*
	(0.0362)	(0.0159)	(0.0330)	(0.0081)	(0.0089)
Constant	0.5841***	0.1047***	0.1578***	0.0564***	0.0324***
	(0.0203)	(0.0078)	(0.0177)	(0.0049)	(0.0040)
Fixed Effects	Individual, Firm, Year-month				
# of individual	7195				
Observations	93,535				
R-squared	0.2682	0.2717	0.5441	0.3149	0.2152

China's Two Child Policy and Gender Wage Gap

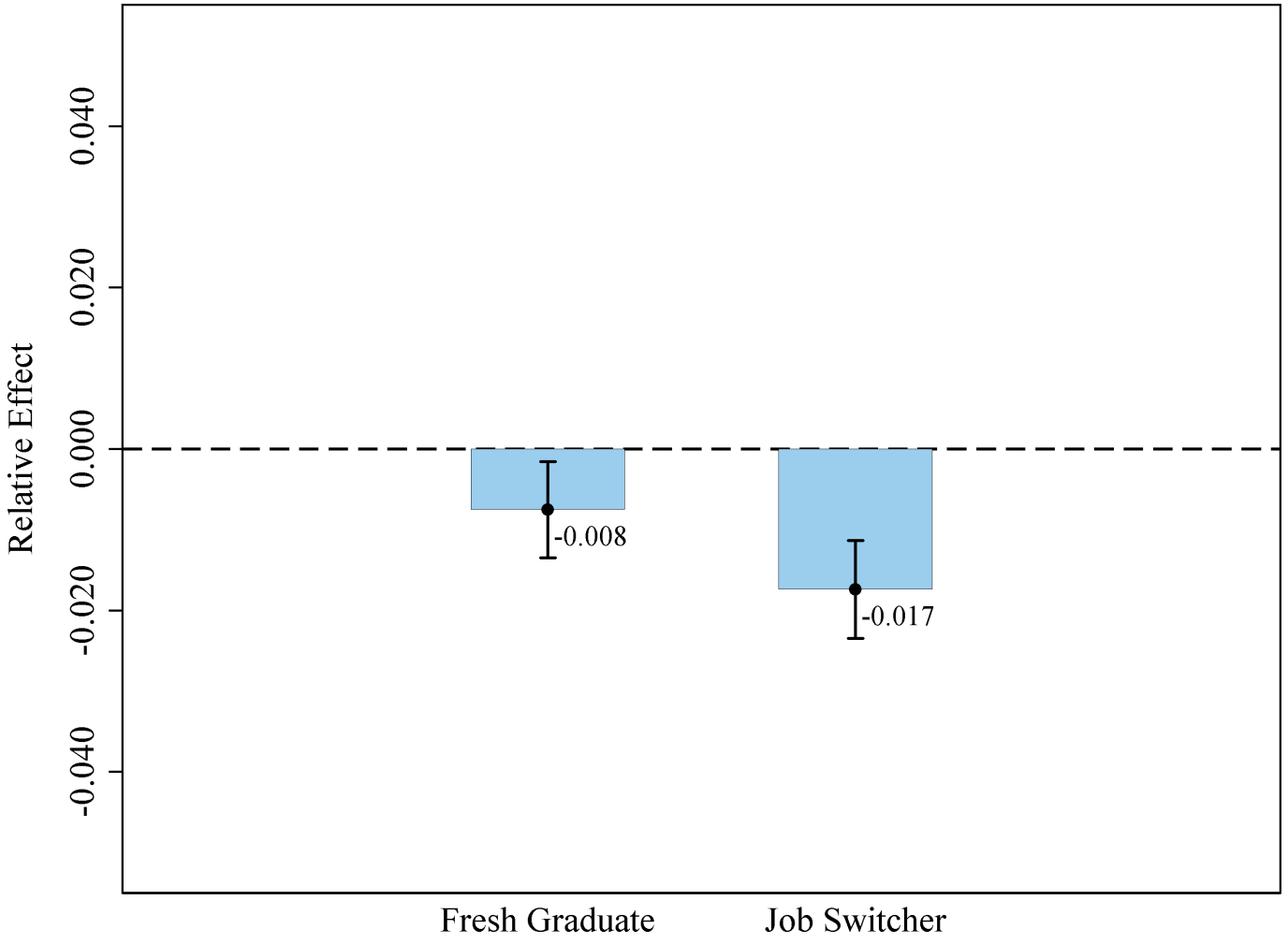
We use the first quarter of 2012 as the baseline year



China's Two Child Policy and Gender Wage Gap



China's Two Child Policy and Gender Wage Gap



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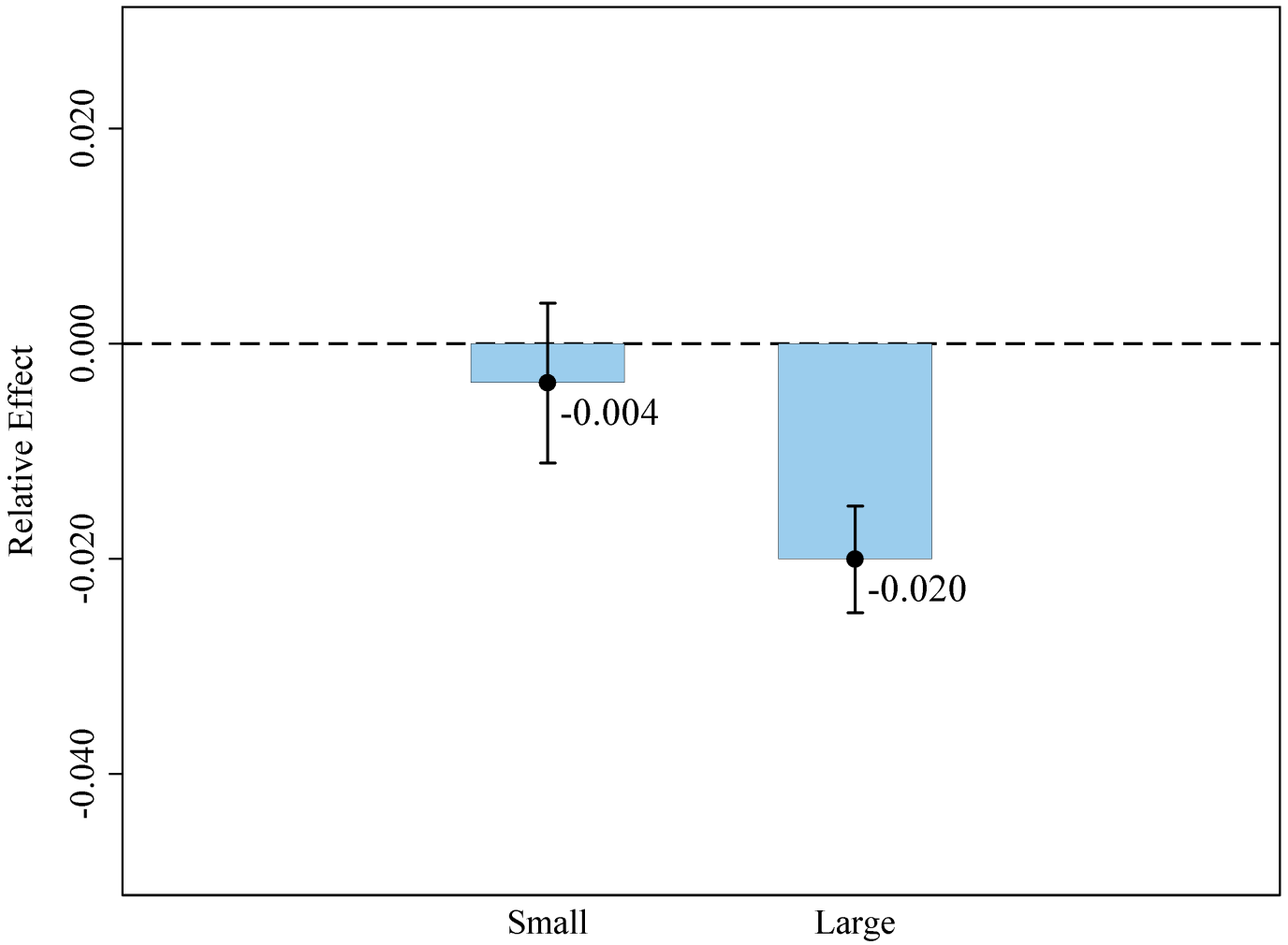

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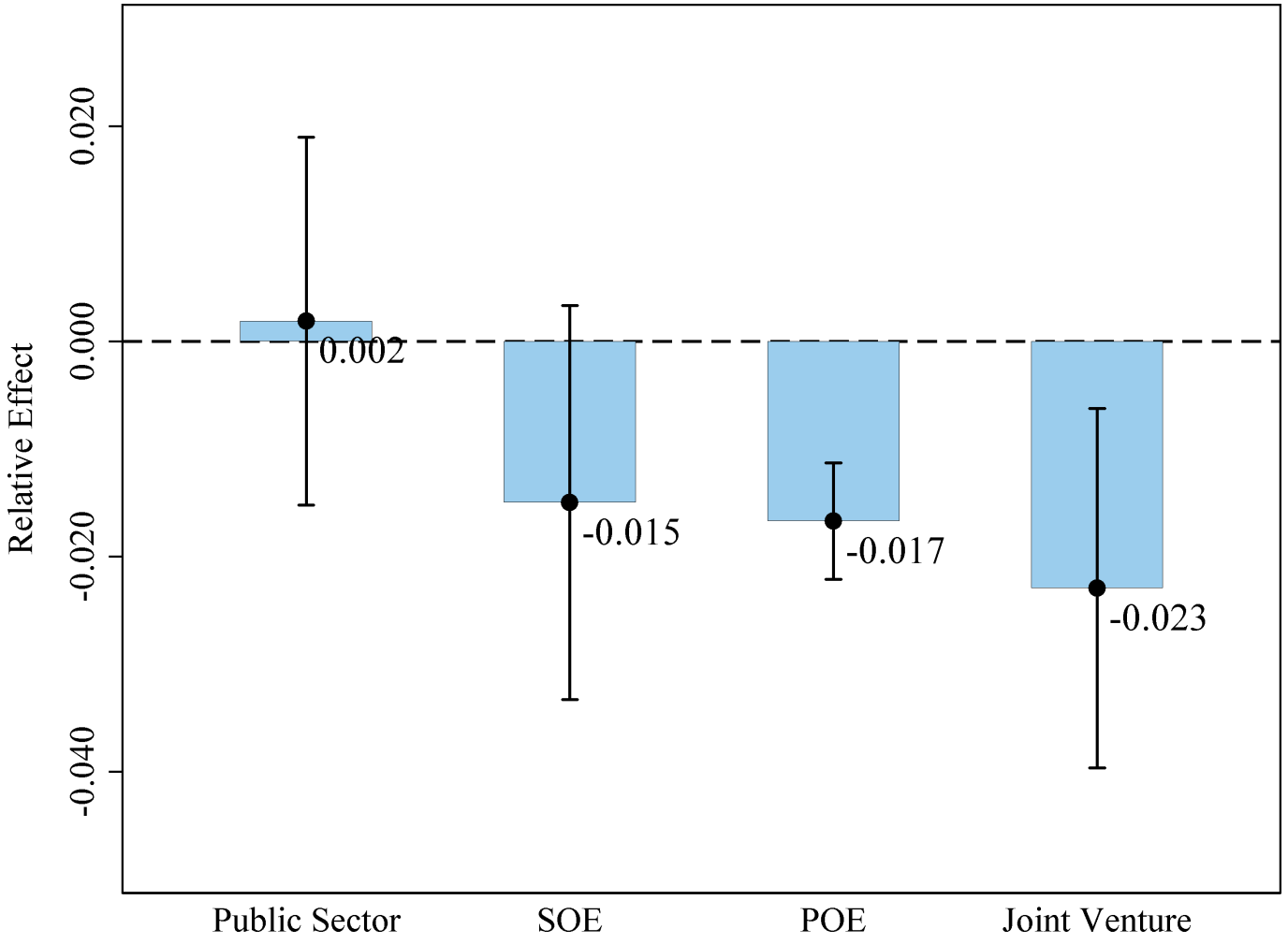
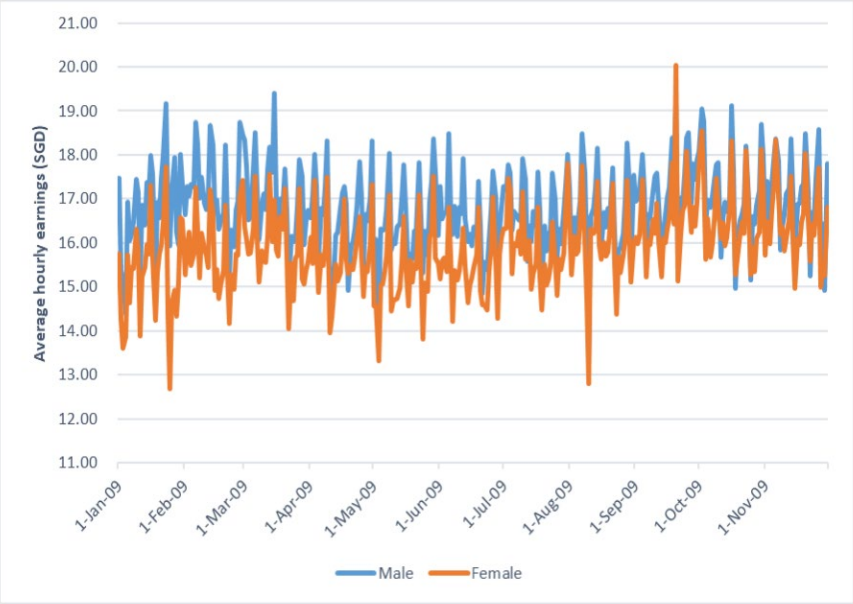
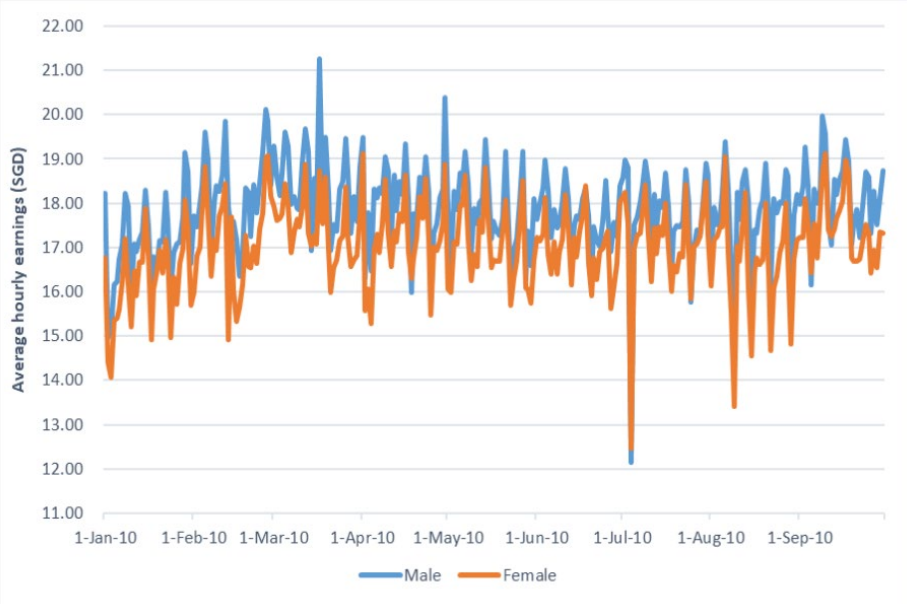


Gender Wage Gap among Taxi Drivers in Singapore

The gender gap in earnings is stable and persistent.

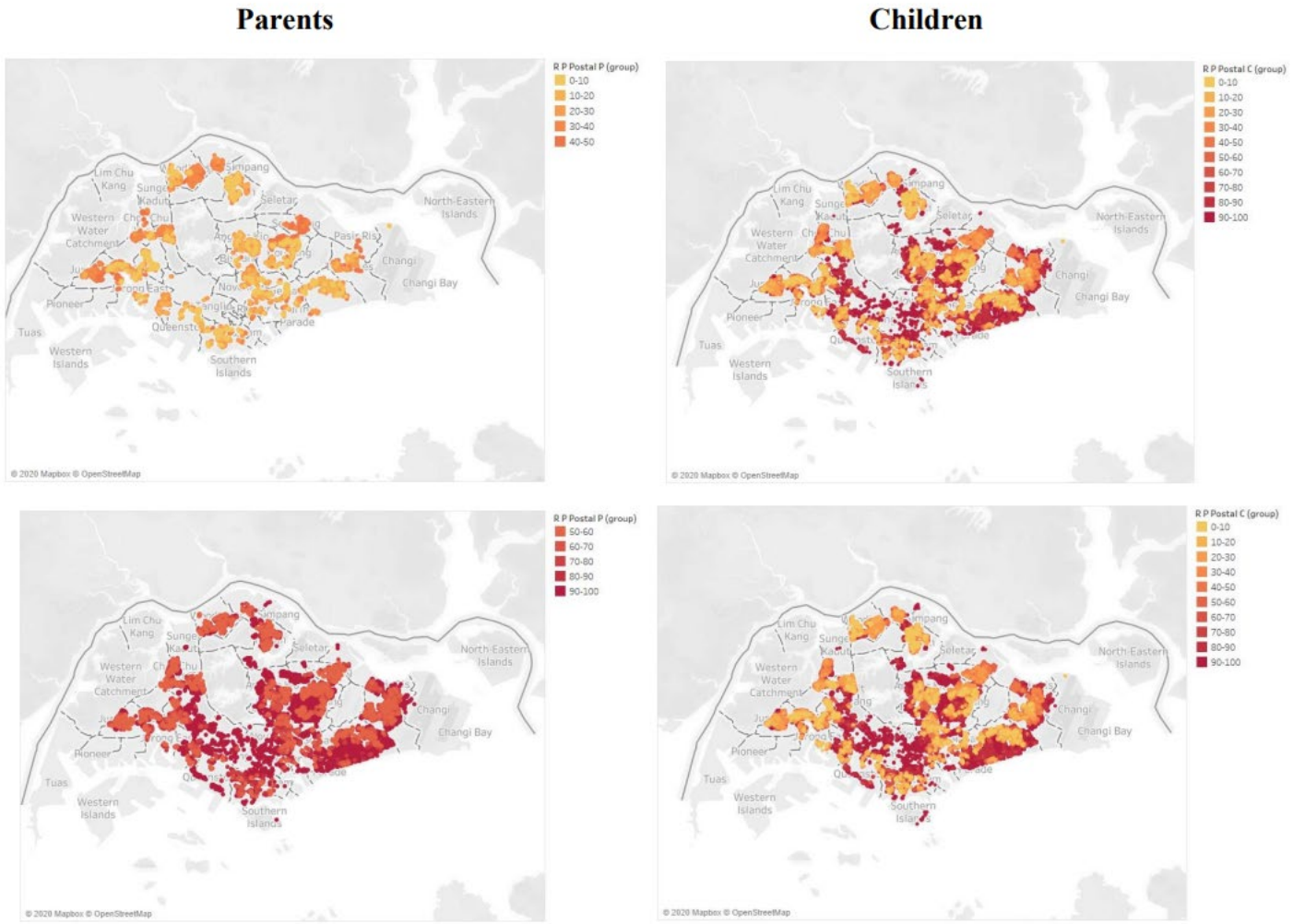




Average Hourly Earnings by Gender in 2009 and 2010

Intergenerational Mobility in Housing Consumption

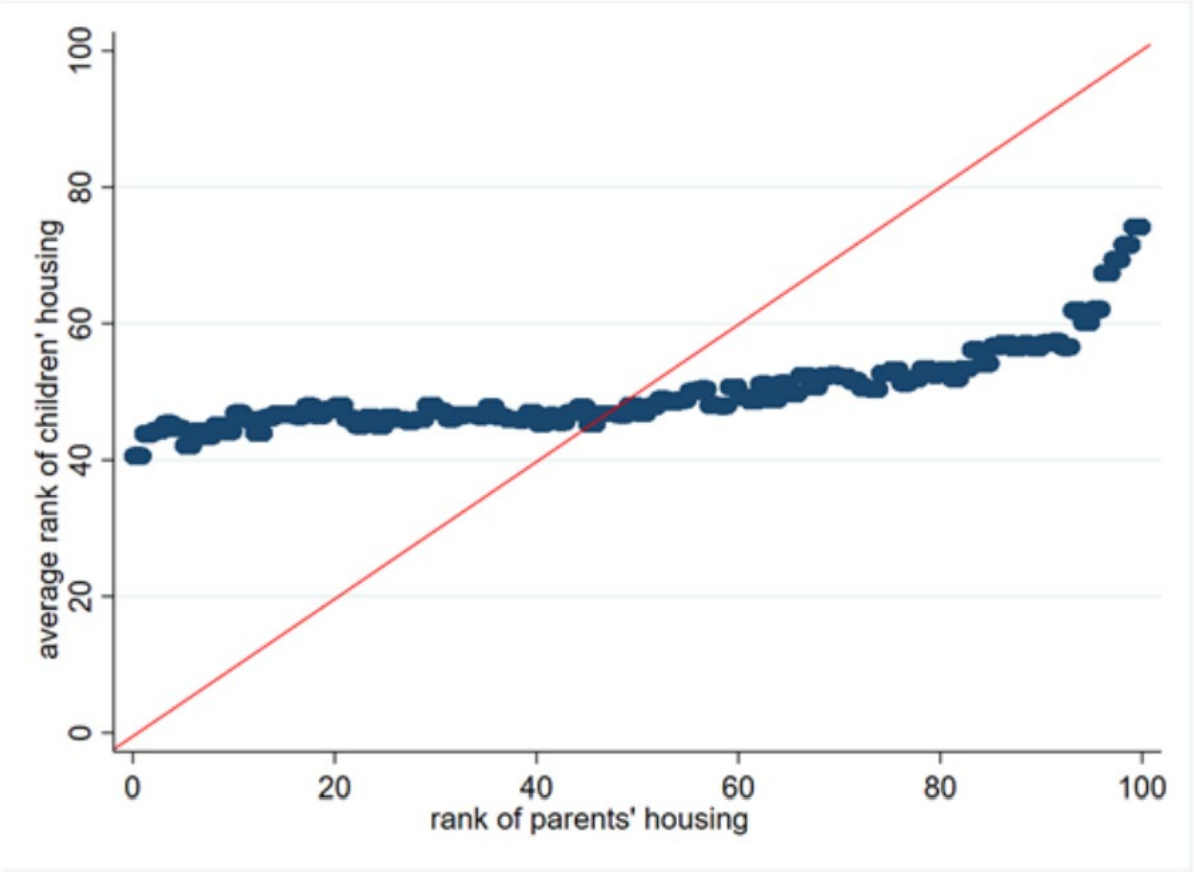
We focus on pattern and mechanism of correlation in housing consumption across generations



Housing Ranks of Parents and Children Conditional on Parents in the Bottom(Upper) and Top(Lower) 50%

Intergenerational Mobility in Housing Consumption

We focus on pattern and mechanism of correlation in housing consumption across generations



Child's Housing Ranks versus Parents' Housing Rank

Intergenerational Influences on Personal Bankruptcy

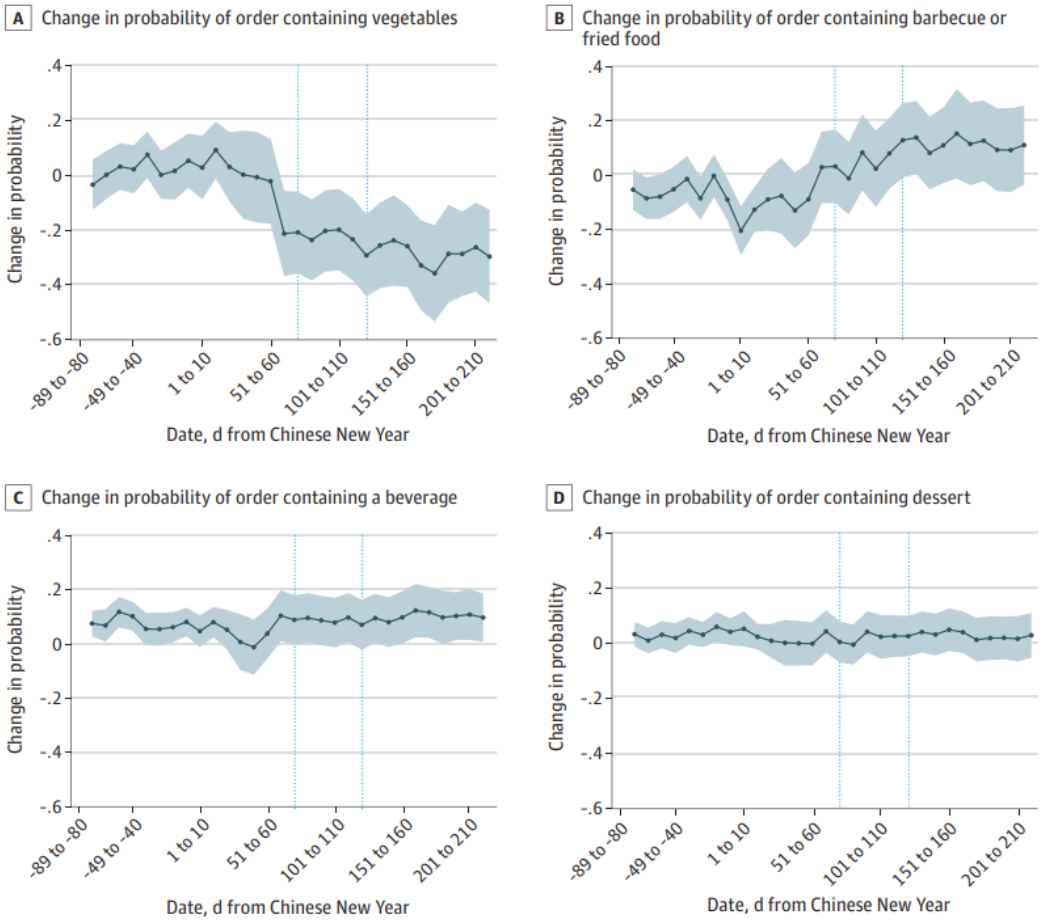
The effect of parental bankruptcy on children's financial behavior in adulthood

Table 2 Parental Bankruptcy and Adulthood Financial Behavior

DV	(1) Bankruptcy=1	(2) Credit Card Default=1	(3) Other Credit Facilities=1
$\mathbf{1}_{Age\leq 0_{i,h}}$	-0.034**	-0.031*	-0.076**
	(0.015)	(0.017)	(0.030)
$\mathbf{1}_{Age1\_4_{i,h}}$	-0.027**	-0.020*	-0.053**
	(0.012)	(0.012)	(0.022)
$\mathbf{1}_{Age5\_17_{i,h}}$	-0.019**	-0.009	-0.022*
	(0.008)	(0.008)	(0.013)

- Circuit Breaker (CB): the Singaporean lockdown between Apr 7 - Jun 1, 2020.
- Order-level food delivery data
  - A Singapore-based online platform (market share around 10%).
  - Contents: order items, bill amount, date and time of order placement and arrival, payment methods, and so on.
  - Four identified food categories: vegetable, barbecue/fry, beverage, dessert.

Figure. Change in Probability of Ordering Different Kinds of Food During the COVID-19 Pandemic



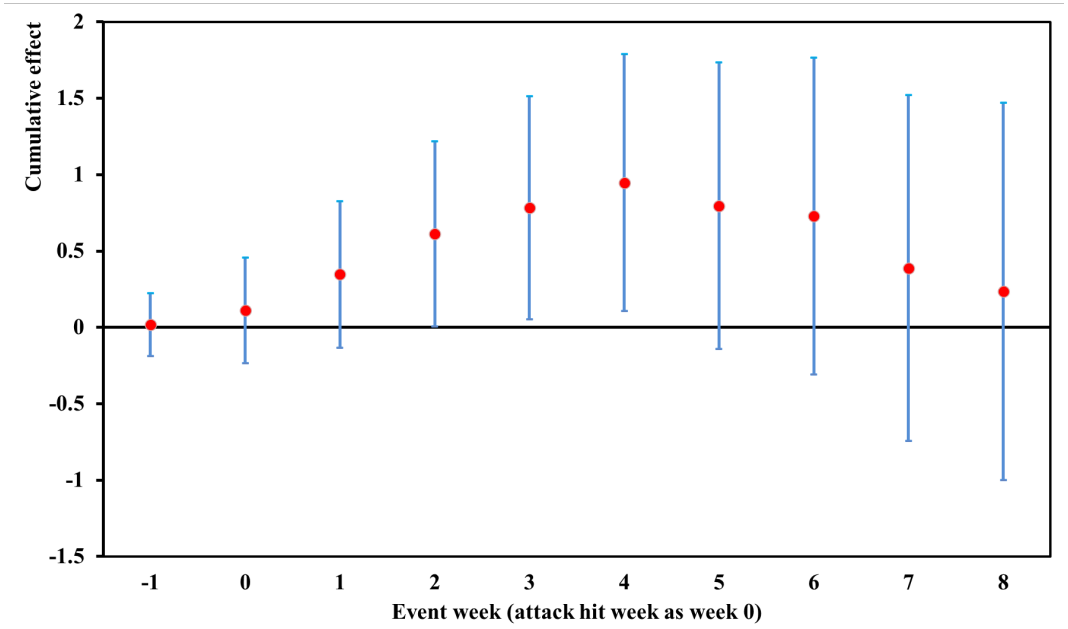
Terrorist Attacks and Household Credit Smoothing

- Will consumers smooth consumption in response to negative shocks through utilizing their existing unsecured credit (eg., credit cards)?

- Investigate ***the impact of negative uncertainty shocks (i.e., terrorist attacks) on household credit smoothing***
  - Individual-level panel dataset from a leading Indian bank
    - Over 37 million bank card transactions (credit+debit) during 2014.01.01-2017.12.31
    - Transaction level information: amount, date, card type, goods type
    - Over 180,000 bank consumers in 9 major cities
  - Weekly real-time credit smoothing measure
  - Comprehensive information on household portfolio and individual characteristics
    - ATM withdrawal, salary deposition, credit limit changes, savings account balance, investment balances, loan approval, credit card debt revolving status
    - Age, gender, residential postal (city and state), etc

Results

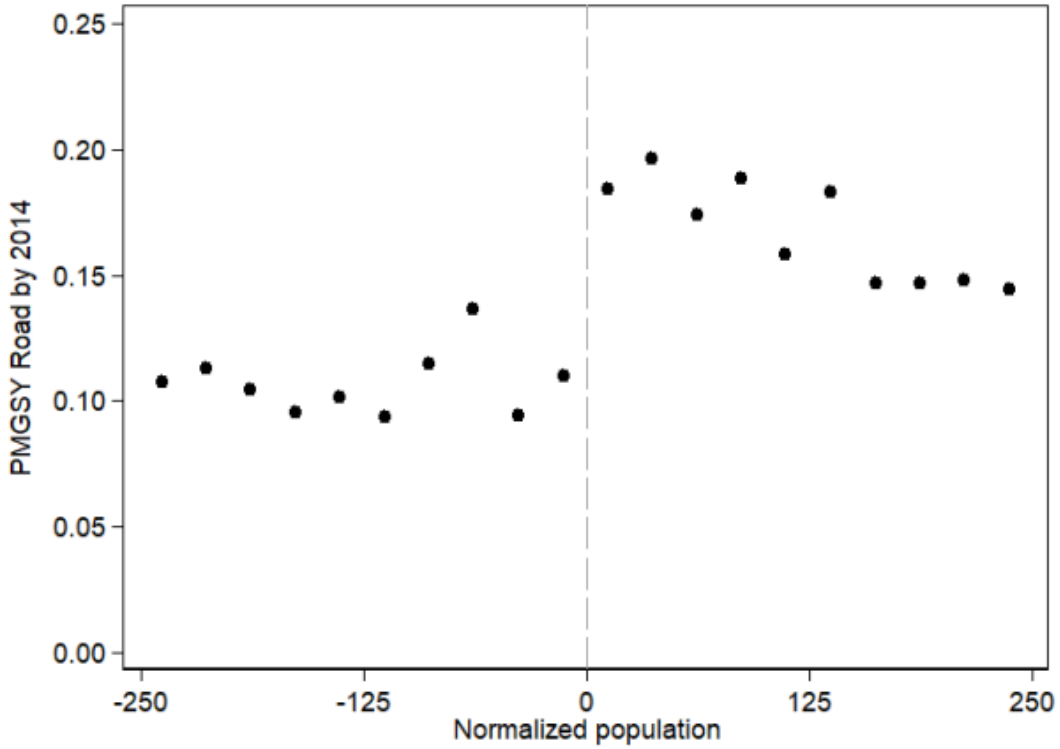
Panel A: Average response	*Credit card spending/Total card spending* (%)	
	(1)	(2)
Attack×Pre-1 week		0.040
		[0.10]
Attack×Post[0,4 week]	0.200***	0.201***
	[0.07]	[0.07]
Constant	67.214***	67.213***
	[0.01]	[0.01]
Observations	6,759,898	6,759,898
Adjusted R-squared	0.54	0.54
Individual FE	Yes	Yes
Year-week FE	Yes	Yes



Roads and Loans*

- Does financing respond to changes in productive opportunities, especially the rural poor areas?

Figure 5: First stage: effect of road prioritization on probability of PMGSY road by 2014



* Agarwal, S., Mukherjee, A., & Naaraayanan, S. L. (2022). Roads and loans. Review of Financial Studies, forthcoming

Results

	Panel A: Bank entry	
Bandwidth	± 200	± 250
	(1)	(2)
Above cutoff	2.003*	1.733**
	(1.059)	(0.858)
State fixed effects	Yes	Yes
Threshold fixed effects	Yes	Yes
Observations	93	116

	Panel B: Number of customers	
Bandwidth	± 200	± 250
	(1)	(2)
Above cutoff	0.938**	0.652*
	(0.409)	(0.374)
Control group mean	1.012	0.867
State fixed effects	Yes	Yes
Threshold fixed effects	Yes	Yes
Observations	93	116

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Social sustainability- Lifecycle planning, aging population, and retirement safety

- Studies document significant consumption drop after retirement (Banks, Blundell, & Tanner, 1998; Bernheim, Skinner, & Weinberg, 2001)
  - Retirement was not anticipated (Haider & Stephens Jr, 2007)
  - Individuals have more time after retirement searching cheaper goods or home production (Aguiar & Hurst, 2005, 2007a, 2007b; Li, Shi, & Wu, 2015; Agarwal, Pan, and Qian, 2015)
- Agarwal, Pan, and Qian (2020): Qualified individuals who reaches age of 55 tend to withdraw part of their pensions to reduce debt and increase consumption
- Agarwal, Hu, and Huang (2016): high past housing price growth increases expectations of future price growth thus accelerating home purchases at younger ages
- Agarwal, Chomsisengphet, and Liu (2011): default/bankruptcy risk rises and then falls over the lifecycle, while a borrower who owns a home or is married has a lower risk of default/bankruptcy
- Agarwal et al., (2009): financial mistakes follow a U-shaped pattern, with the cost-minimizing performance occurring around age 53.

Social sustainability- Inequality and social norms

- Gender gap and discrimination
  - Agarwal et al., (2018): gender difference plays an important role in the mortgage signing order beyond pure economic power
  - Agarwal et al., (2018): women' odds in bankruptcy events is 28% of the men's odds
  - Agarwal et al., (2016): women golfers are more likely to serve on board of public firms than male golfers
  - Agarwal, Li, and Mielnicki (2010): individual banks can conduct independent and statistically rigorous fair-lending examination to mitigate minority discrimination in mortgage lending
- Superstition beliefs create real impacts in decisions
  - Agarwal, et a., (2021): Chinese babies born in Dragon years (i.e., the preferred zodiac) earn significantly lower income than other Chinese cohorts after entering the labor market, mainly due to more fierce competition for (public) resources

Social sustainability- Infrastructure construction and government intervention

- Minimum wage
  - Aaronson, Agarwal, and French (2012): minimum wage hikes induce household durable consumption through collateralized debt
  - Agarwal, Ambrose, and Diop (2022): increasing minimum wage significantly reduce renters defaulting on lease contracts
  - Agarwal, Ayyagari, and Kosova (2022): doubling minimum wage reduces average hotel revenues and occupancy rates
- Bankruptcy protection
  - Agarwal et al., (2005): higher state exemptions lead to higher bankruptcy for both small business and small business owners
  - Agarwal, Liu, and Mielnicki (2003): loose garnishment and property exemption laws increase delinquency

- Employee protection
  - Agarwal, et al., (2021): India government's employment guarantee program crowds out labor supply in private-sector firms; firms respond by substituting labor with increased mechanization, which increases costs and reduces profits.
  - Agarwal and Liu (2003): county unemployment rates significantly influence delinquency
  - Agarwal, et al., (2020): restricting loan officers' labor mobility leads to better ex ante screening and ex post monitoring
- Infrastructure construction
  - Datta and Agarwal (2004): significant and positive correlation between telecommunications infrastructure and growth
  - Agarwal, Mukherjee, and Naaraayanan (2022): Roads connecting rural villages leads to large private bank financing responses
- Education
  - Agarwal et al., (2016): relocation of school leads to drop in housing prices around the old school neighborhood
  - Agarwal et al., (2010): long-term voluntary financial education program helps to persistently reduce ex post delinquency rates
  - Agarwal, et al., (2022): access to sanitary pads improves education outcomes

Social sustainability- social networks and family impacts

- Social networks can bring information advantage and within-network business
  - Agarwal, et al., (2019): sellers sell homes in blocks with a high concentration of their own (other) ethnic group at significant premiums (discounts); sellers may prefer within-ethnicity transactions despite the price discounts, supporting the market segmentation through ethnic social network.
  - Agarwal et al., (2019): real estate agents use information advantage to obtain lower prices for own houses, particularly from distressed sellers
- Family members can influence individual behaviors
  - Agarwal et al., (2017): school children can successfully nudge their parents and neighbors to save more energy
  - Agarwal et al., (2016): joint liability lending may not necessarily reduce credit risk
  - Agarwal et al., (2021): a firm has a chairperson with siblings tend to have better innovation, suggesting a family-based human capital embedded in the sibling relationships

Social sustainability- Impact of social events

- Pandemic
  - (City lockdown due to) Covid-19 outbreak leads to changes in household consumption patterns and lifestyle such as unhealthy eating behavior (Baker, et al., 2020; Chen, Qian, and Wen, 2021; Agarwal, et al., 2021a):
  - Agarwal, et al., (2021b): U.S. federal government's Paycheck Protection Program (PPP) following the COVID-19 pandemic reduced mortgage delinquencies and eased economic distress beyond the labor market
- Terrorist attacks
  - Agarwal, et al., (2022): individuals strategically switch consumption from debit accounts to credit cards temporally to smooth consumption following terrorist attacks
- The Great Recession
  - Agarwal, Gross, and Mazumder (2016): tightened credit supply after the Great Recession lead to a mild increase in more expensive payday loan borrowing

Social sustainability- Lifestyle

- Agarwal et al., (2020): public transport commuters have heterogeneous preferences on transportation services
- Agarwal, Deng, and Li (2019): environmental regulation increases house price in areas with low manufacturing intensity while weaken housing market in high-manufacturing-intensity areas
- Agarwal, Kang, and Sing (2015): Congestion toll rate increases cause a 19% drop in retail real estate prices within the cordon ERP areas
- Agarwal, Chua, and Song (2020): price information of better-quality products will lead to higher inflation expectations

Social sustainability- Big data and FinTech

- Big data inputs can improve efficiency
  - Agarwal, et al., (2022): Adding ride-hailing surge factor from machine-learning-based demand predictions improves allocative efficiency of taxis
  - Agarwal, Qian, and Zou (2021): disaggregated sales from credit card provides information relevant to customer demand, leading to stock return predictability
  - Agarwal, et al., (2021): based on residential transaction dataset, a 3D real-time interactive heat map allows better visualization of regional variations and heterogeneity in price appreciation trends

Financial Sustainability

Household Sustainability

- Consumers are ill- prepared to make sound decisions in ↑ complex financial environment
  - Social security privatization
  - 401K plans under participation
  - Lack of sufficient portfolio diversification
  - Choosing right mortgage ARM/FRM
  - Subprime mortgages
  - Optimal refinancing timing
  - Payday & pawn lending

Household Sustainability

- A bank in the US advertises 3000 different types of credit cards with varying:
  - Interest rates
  - Fee rates
  - Reward options
    - Travel
    - Auto
    - Gas
    - Hotel rewards
- Is it a daunting task to choose a card that best fits the consumer needs?

Household Sustainability

- Some argue consumers make wrong choices = incur high interest & fee payments
- Others argue financial intermediaries extract excess rents customers
- Most agree consumers need ↑ education
  - Financial planning
  - Financial literacy

Household Sustainability

- Financial Sustainability
  - Role of financial literacy and education in financial decision making.
  - Mistakes in using financial products, ARM-FRM, mortgage refinancing, fee payments, etc.
  - Consumption and savings decisions.
  - Under-participation and under-diversification in the stock market.

Do consumers make mistakes in choosing a credit card?

- **Unique experiment: a large bank offers consumers 2 choices**

Credit Card 1:	Credit Card 2:
12% Interest Rate	15% Interest Rate
$20 Annual Fee	No Annual Fee

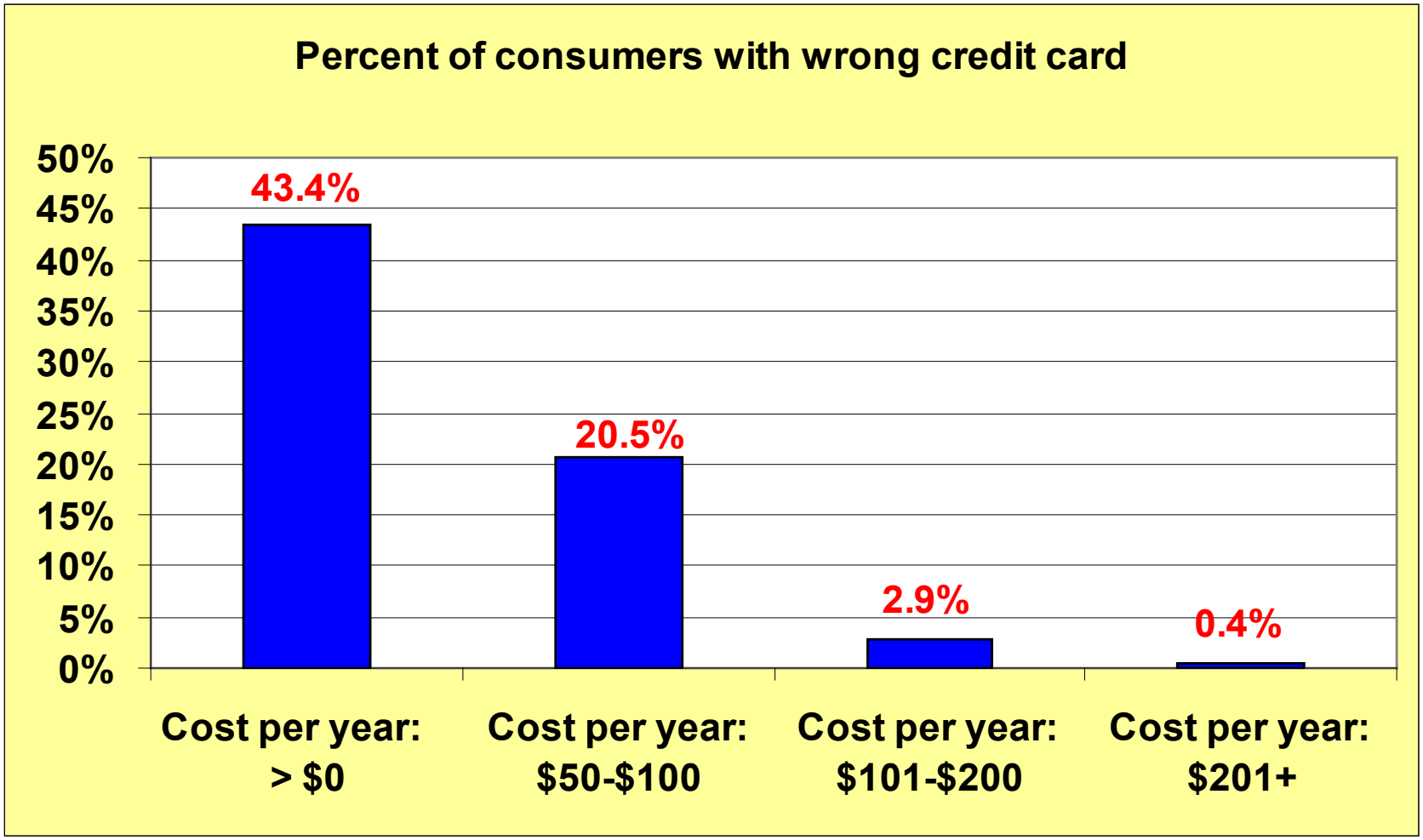
- Can switch at any time!

- **Optimal choice:**

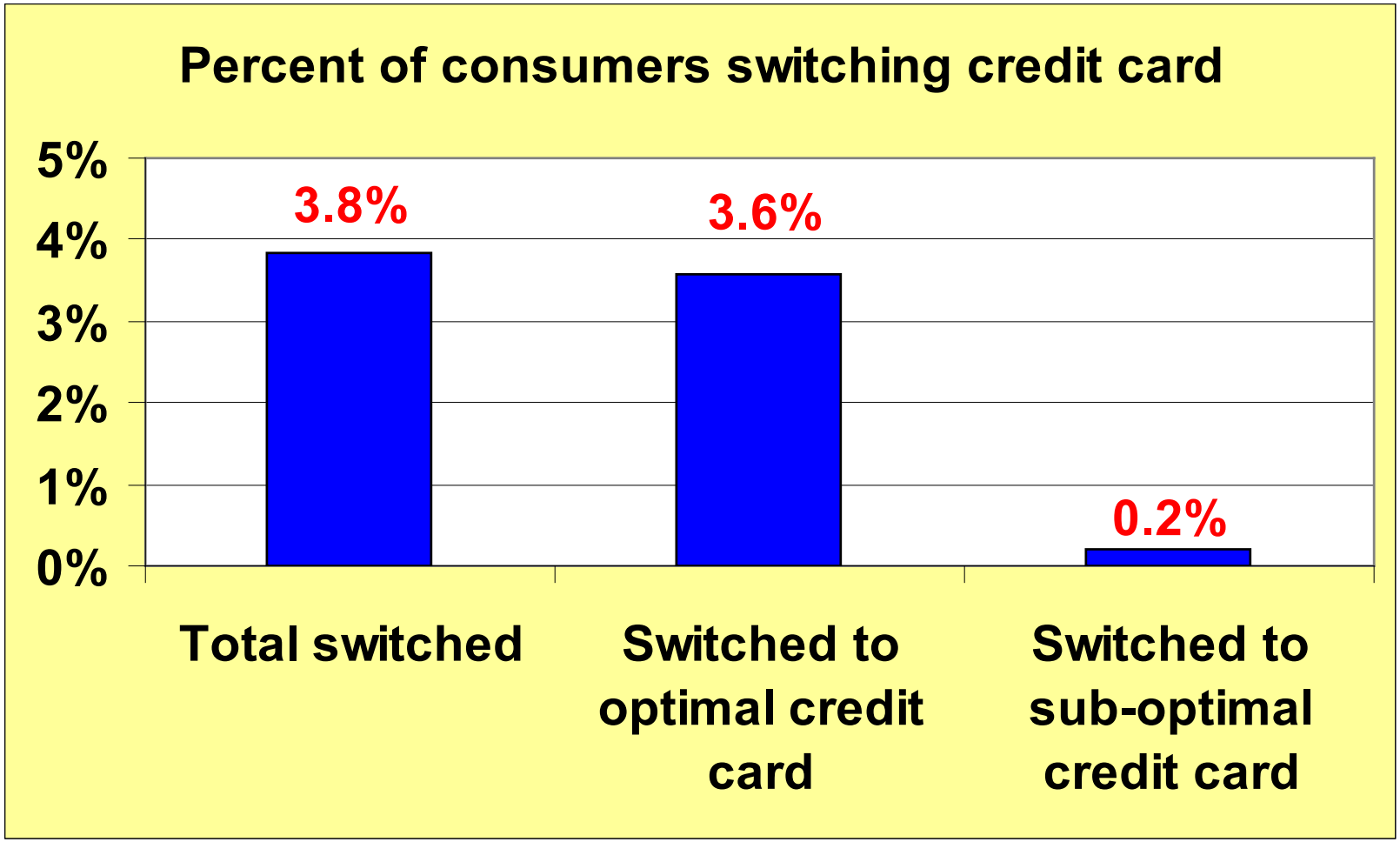
⇒ consumers expecting to borrow should choose Card (1)

⇒ consumers expecting not to borrow should choose Card (2)

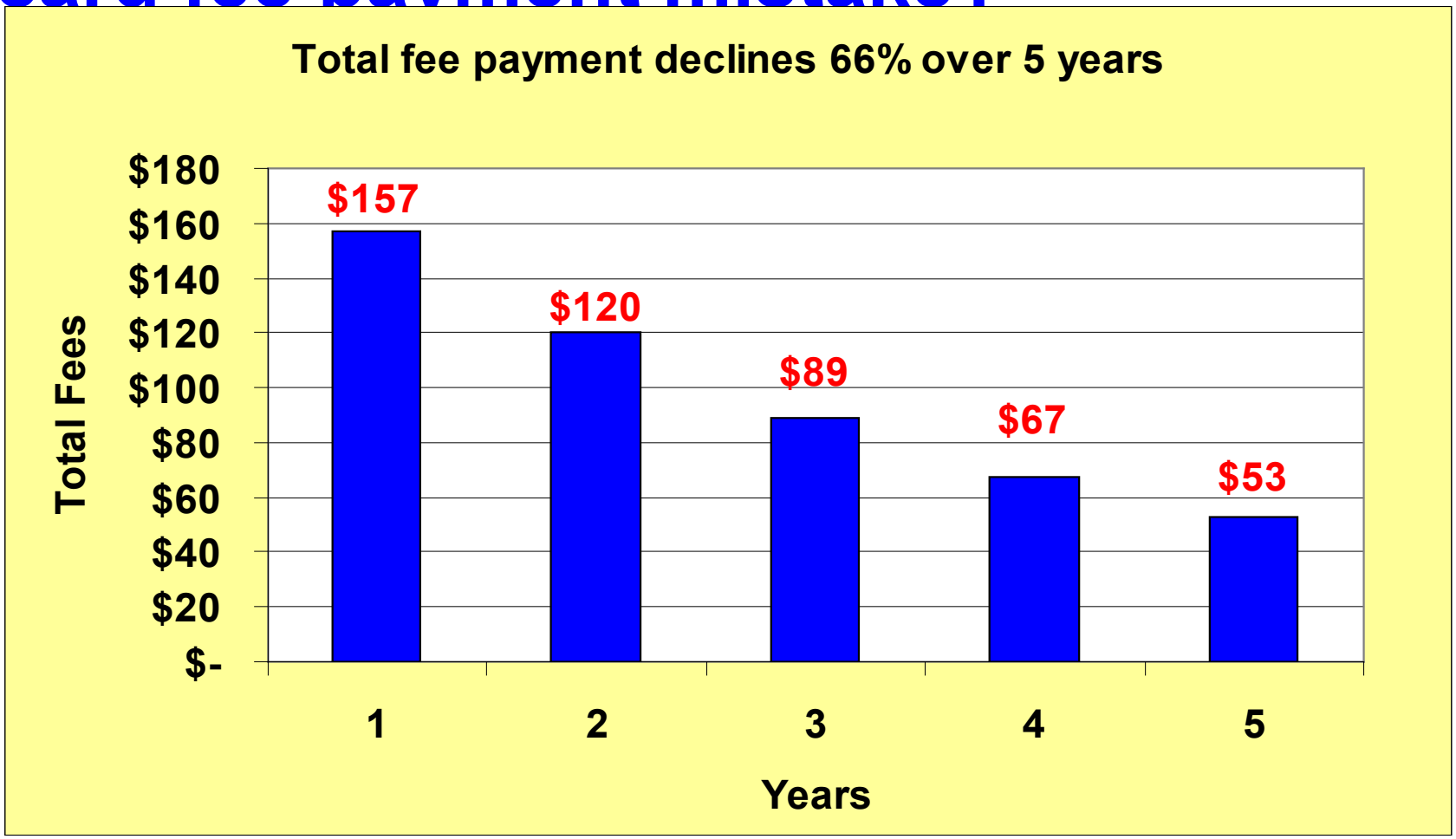
Do consumers make mistakes in choosing a credit card?



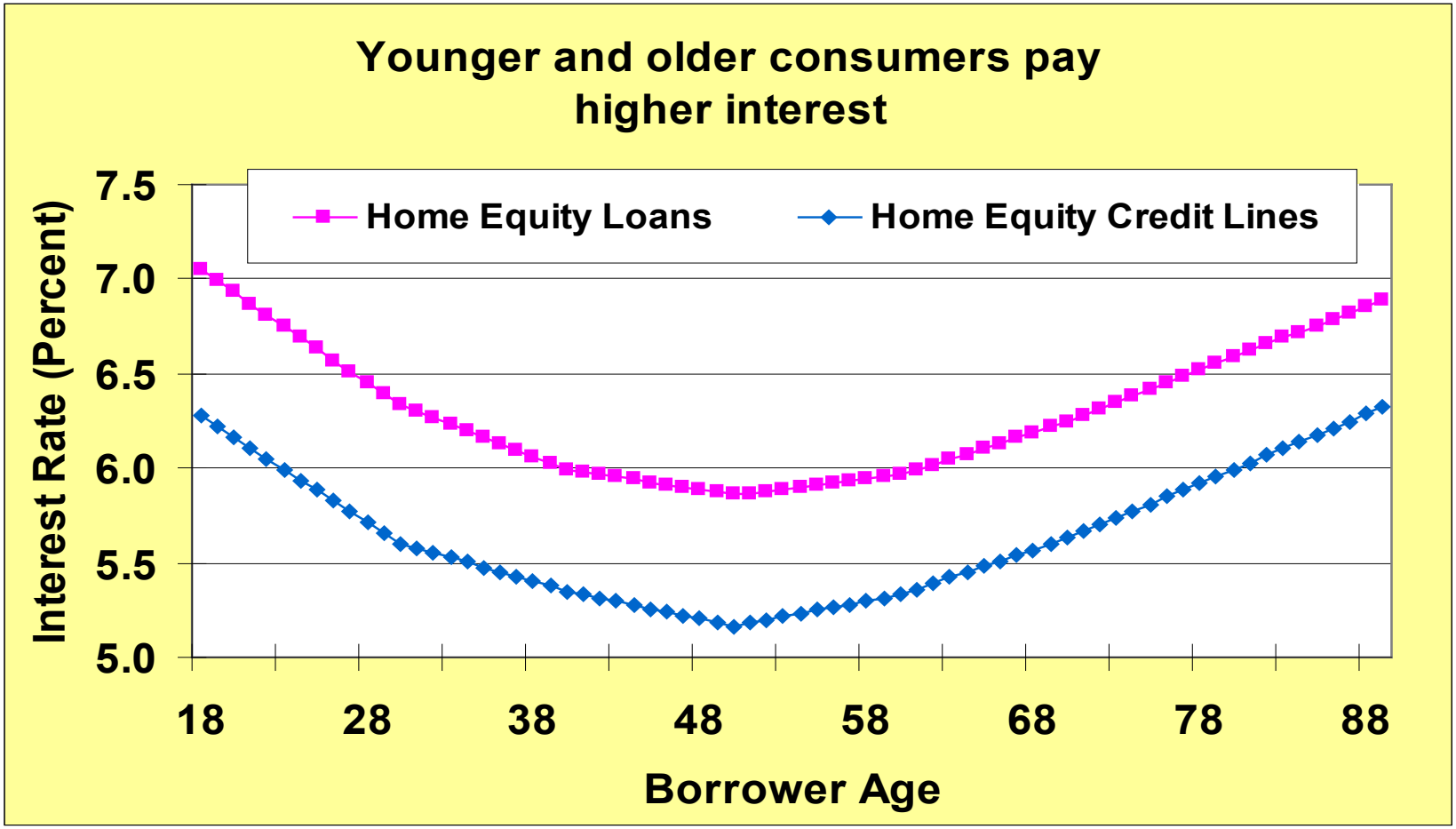
Do consumers learn from their credit card choice mistake?



Do they learn from their credit card fee payment mistake?



Do financial mistakes vary by age?



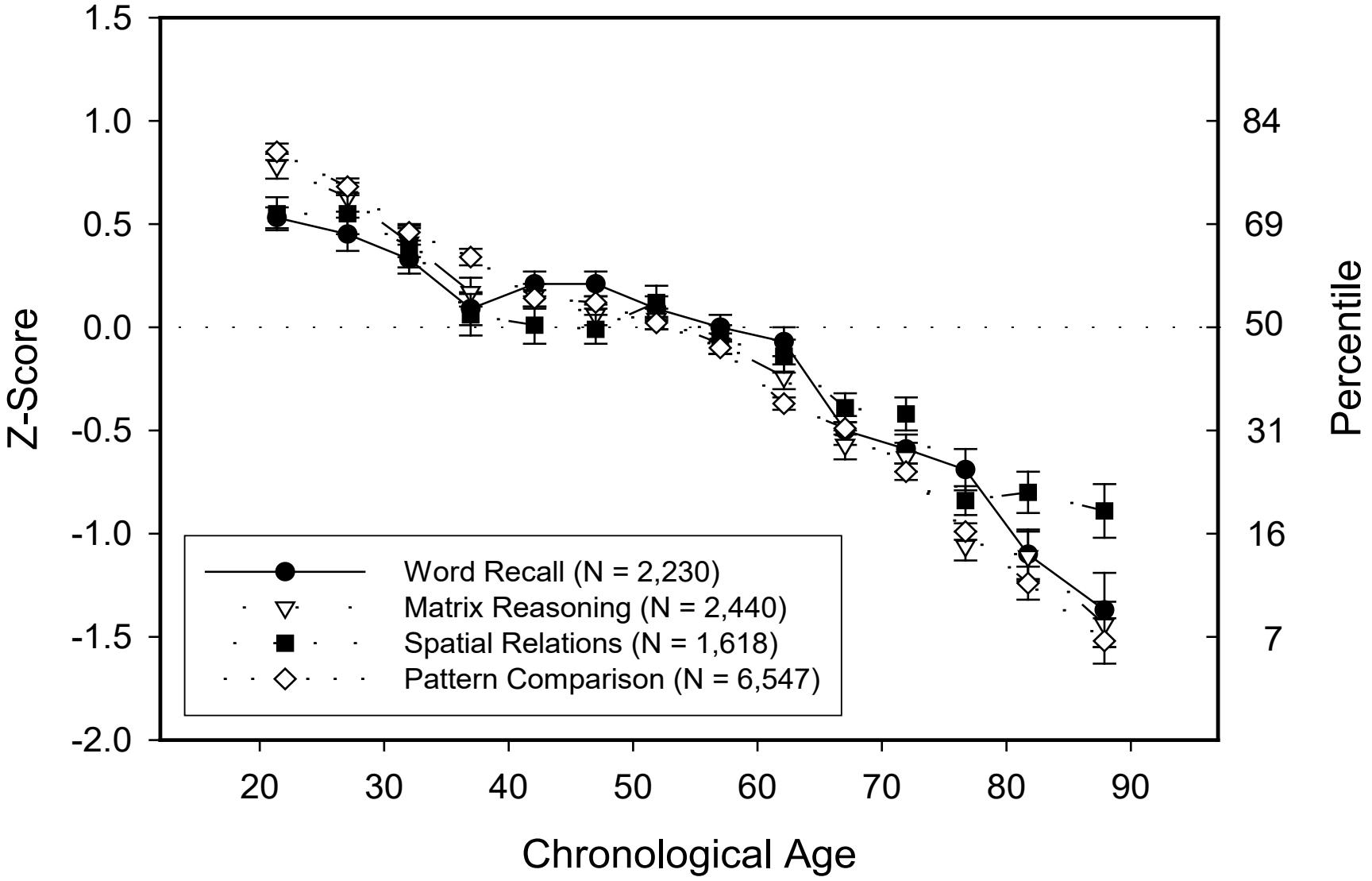
Do financial mistakes vary by age?

- Similar U-shaped pattern of mistakes also exist in
  - Small Business Interest Rates
  - Mortgage Interest Rates
  - Auto Loan Interest Rates
  - Credit Card Interest Rates
  - Credit Card Fees (Late, Over Limit, Cash Advance)

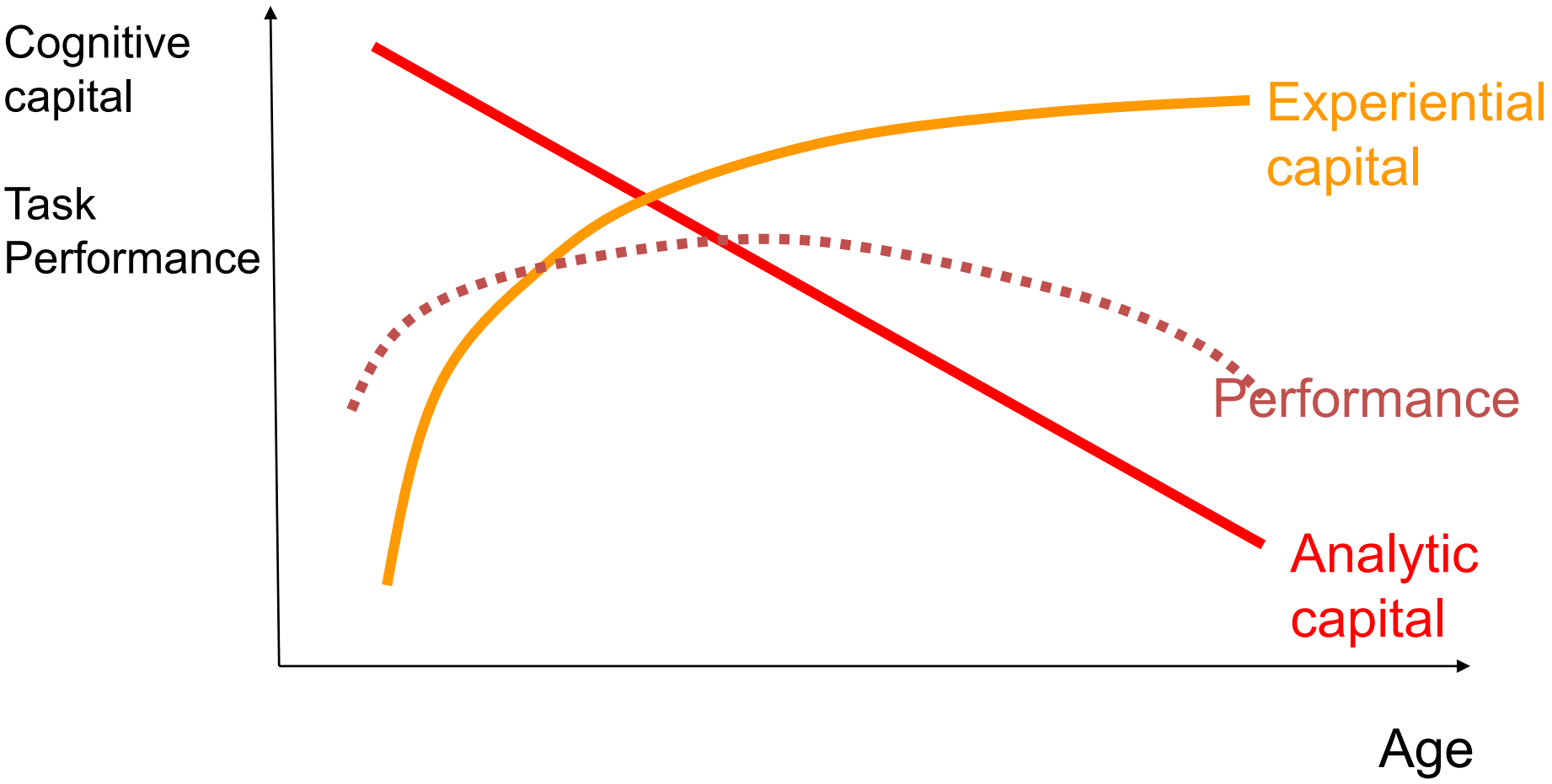
Possible explanations

- Age-related cognitive effects
  - Declining analytical performance (“I.Q.”) with age
  - Rising experience with age

Salthouse Studies – Memory and Analytic Tasks



Source: Salthouse (



Hypothesized link between Performance and Age

Balance Transfer Mistake

- Customers are offered an opportunity to transfer existing balances from a previous credit card (card A) to a new card (card B), with a low teaser rate.

usbank VISA

A Visa® Platinum Card that gets better

A-12150-2620090-B-7101-00102-04420-00000
Bhashkar Mazumder
1
4058 N. Kilbourn Ave.
Chicago, IL 60641-1909

0.00%
Introductory APR
on Purchases*

Dear Bhashkar Mazumder,

Your excellent credit history pre-qualifies you for the U.S. Bank® Visa® Platinum Card. Visit **usbank.com/myoffer** to apply now. Your new card features:

- **0.00% introductory APR*** for 12 billing cycles on all purchases
- **0.00% introductory APR*** for 12 billing cycles on all balance transfers
- **No annual fee****

You'll also receive FREE cardmember benefits like fraud protection, online account management, travel accident insurance and more (some restrictions may apply).

Best of all, as a U.S. Bank Visa Platinum cardmember, you can feel confident knowing that you'll receive one-on-one personal attention 24/7.

So don't let this great introductory APR* get away. You're already pre-qualified for this special offer, so **apply now**. Just visit **usbank.com/myoffer**, call 800-360-2900, or mail your Acceptance Certificate in the postage-paid envelope today.

and better

0.00%
Introductory APR
on Balance Transfers*

and *better*

No annual fee**

Generous credit limit

And much more

We apply your payments to balances with lower APR

Sincerely,

L Heitman

Lynn M. Heitman
Senior Vice President

P.S. Receive 0.00% APR* on purchases for 12 billing cycles—visit **usbank.com/myoffer** and enter **Confirmation Code SXW0495069** for faster processing.

* Your introductory APR applies to purchases and the rate is valid for 12 billing cycles. Your introductory APR applies to balance transfers made within 30 days of account application date and is valid for 12 billing cycles. The rate will end early and increase to the APR for purchases and balance transfers or to a Delinquency Rate APR if your Account is delinquent, over the limit or closed. We apply your payments to balances with lower APRs first. We may change APRs, fees, and other Account terms in the future based on your experience with U.S. Bank National Association, N.D. according to the Cardmember Agreement and applicable law.

** Annual fee waived when you make at least one purchase per year. Balance transfer fees apply. See reverse side for details.

Balance Transfer Mistake

- *The Catch*: It is optimal to make *new purchases* only on card A (and NOT on card B), if:
  - You have transferred the entire balance from Card A
  - You only make "convenience" transactions going forward (i.e. you pay off the full amount of new purchases within the grace period)
  - Under these conditions there are no interest charges with purchases made on card A but there are interest charges on purchases made with card B

Balance Transfer Mistake

- A third of customers recognize this immediately, about a third learn this within 6 months.
  - We call this a "Eureka moment" (Agarwal et al 2009)
  - Construct a dependent variable, eureka = 0 if you never learn the optimal behavior, eureka = 1 if you learn within 6 months.
  - We also run models on:
    - learning this immediately
    - the time it takes to reach the Eureka moment.

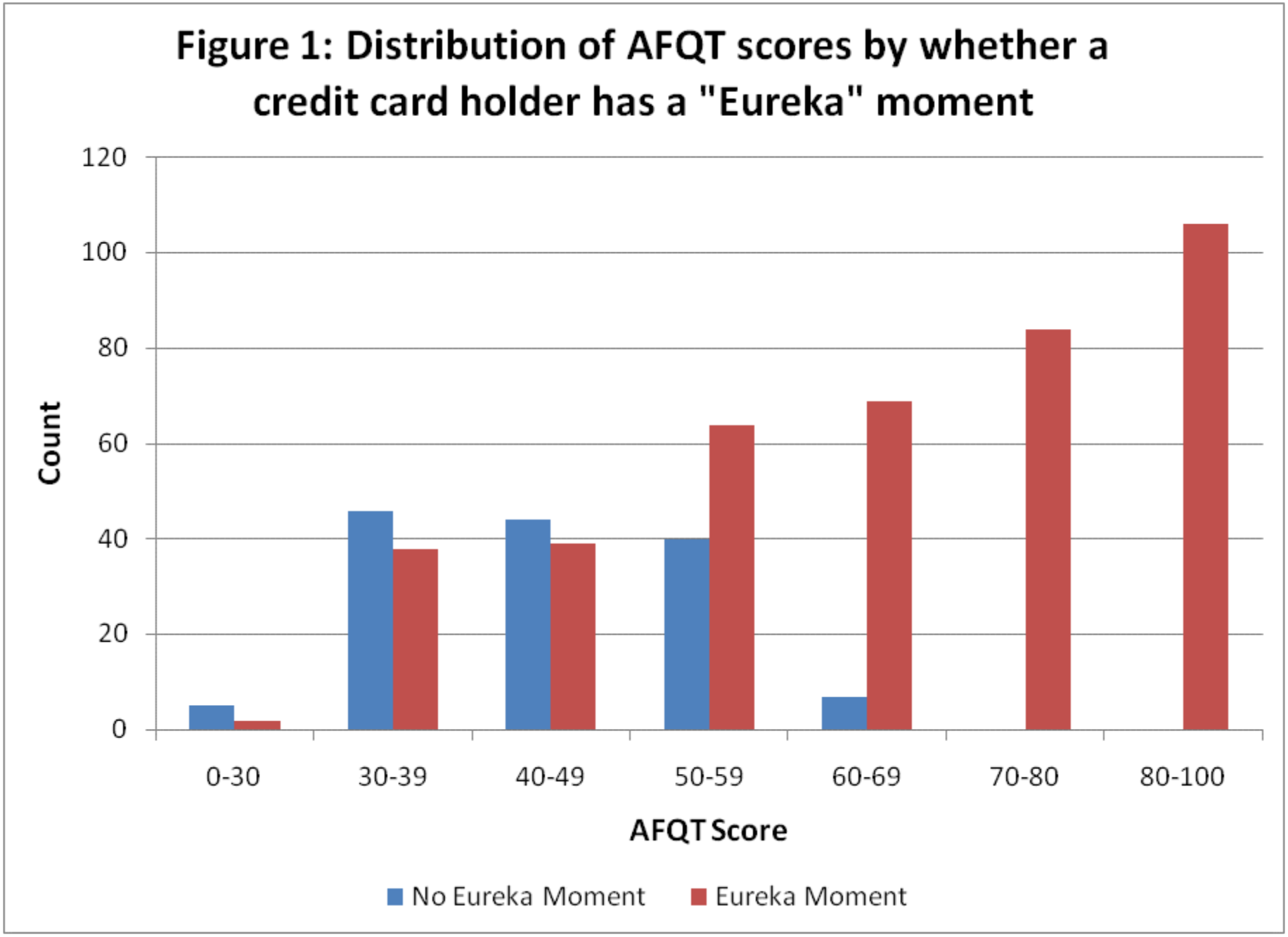


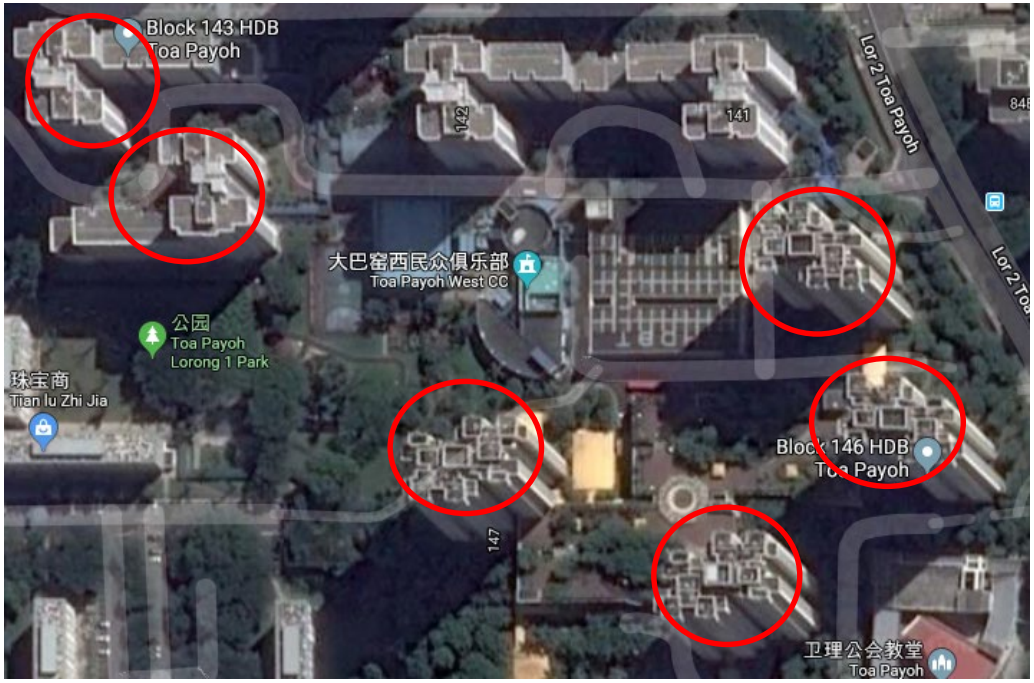
Figure 1: Distribution of AFQT scores by whether a credit card holder has a "Eureka" moment
120
100
80
60
40
20
0
Count
0-30
30-39
40-49
50-59
60-69
70-80
80-100
AFQT Score
No Eureka Moment
Eureka Moment

Financial Sustainability-household financial and economic decisions

- Non-optimal mortgage refinance
  - Households often fail to make optimal refinancing decisions and make errors of commission and omission (Agarwal, Driscoll and Laibson, 2013, Andersen, Campbell, Nielson and Ramadorai, 2019; Keys, Pope and Pope, 2016)
  - Making the refinance decision requires both interest rate picking and correct timing, leading to a non-optimal choice of some households and a cross-subsidy of naïve households to sophisticated households (Campbell, Jackson, Madrian, & Tufano, 2011; Agarwal & Mazumber, 2013; Agarwal, Rosen, & Yao, 2016)
  - Constraints (i.e. poor credit history, low equity position) to be qualified for a new mortgage may impede optimal refinancing (Archer, Ling, and McGill, 1996; Campbell, 2006)
  - high-income and wealthy consumers find it optimal to refinance only if the incentive is sufficiently high (Andersen, Campbell, Nielsen, and Ramadorai, 2019)

Peer Effect in Consumption*

- ***How do households respond to changes in income/liquidity (or behaviour) of their peers?***



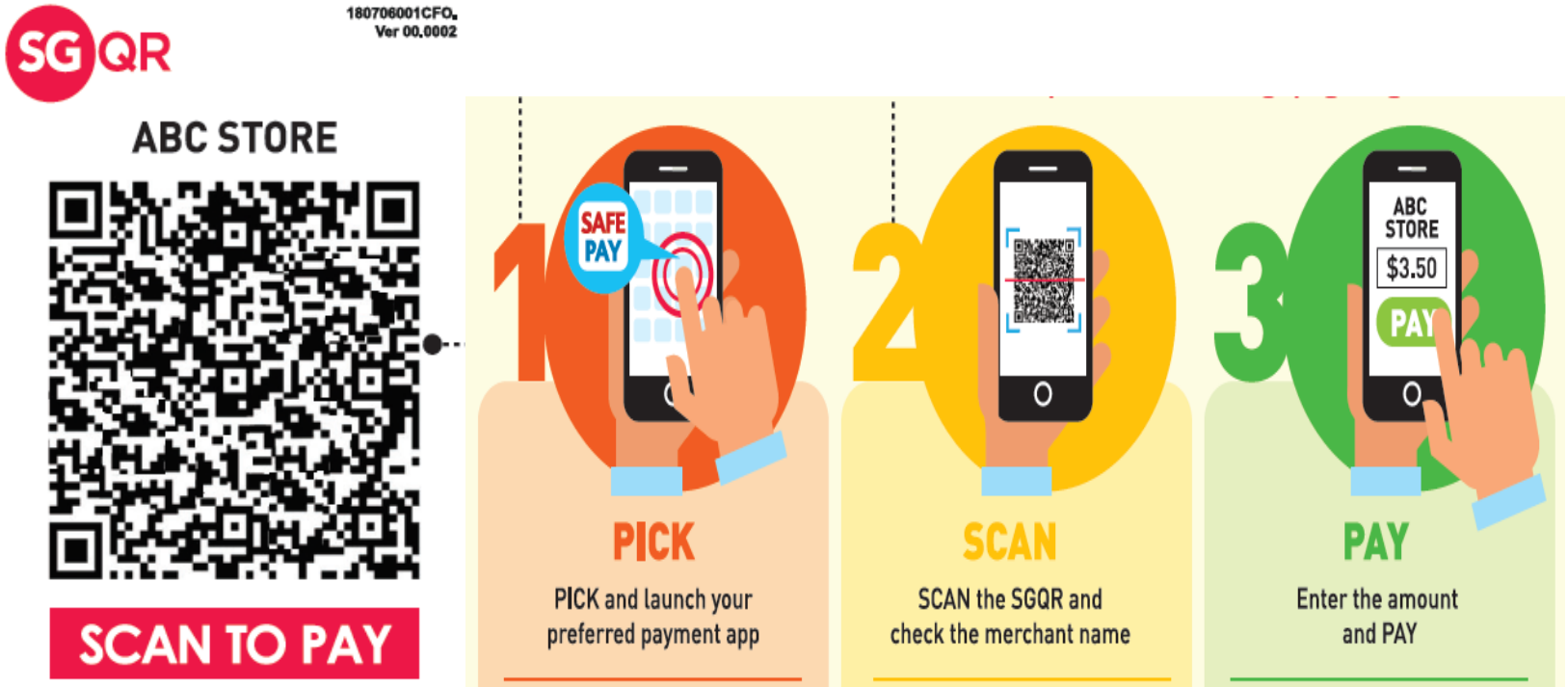
* Agarwal, S., Qian, W., & Zou, X. (2021). Thy neighbor's misfortune: Peer effect on consumption. American Economic Journal: Economic Policy, 13(2), 1-25.

Results

	Log(Total card spending)	Log(Credit card spending)	Log(Debit card spending)
	(1)	(2)	(3)
Immediate month before	-0.011	-0.016	-0.005
	[0.013]	[0.019]	[0.017]
[0, 12 month]	-0.035***	-0.036*	-0.039**
	[0.013]	[0.020]	[0.016]
Individual FE	Y	Y	Y
Year-month FE	Y	Y	Y
Observations	278,054	278,054	278,054

Introduction of QR Code Payment

- Introduction of a new mobile payment technology encourages consumer spending and entrepreneurship growth, and reshapes economic activities (Agarwal, et al., 2019; Agarwal, et al., 2020)



Results

- Average Card Sale Response

	Log(Total sales amount)	Log(Total sales count)
	(1)	(2)
Small Merchant × Pre1	-0.008	-0.000
	(0.42)	(0.02)
Small Merchant × Post	0.034**	0.033***
	(2.47)	(3.39)
Fixed Effects	Merchant, year-month	
Observations	148,460	148,460
R-squared	0.81	0.91

Results

- Business creation

TABLE 2. MOBILE PAYMENT TECHNOLOGY ON BUSINESS CREATION: AVERAGE EFFECT

	(1)	(2)	(3)	(4)	(5)
	Dependent Var. = Log(1+# of new businesses)				
	Full sample		Non-company		Company
Treated*Pre		0.024		-0.033	
		(0.030)		(0.030)	
Treated*Post	0.089***	0.111**	0.123***	0.094*	-0.065
	(0.034)	(0.043)	(0.038)	(0.048)	(0.058)
Fixed effects		Industry, year-month, Industry-division ×year			
Observations	9,226	9,226	9,226	9,226	9,226
Adj R^2	0.898	0.898	0.861	0.862	0.836

Financial Sustainability

- Early economic models usually make simplified assumption: rational and homogeneous households as *homo economicus* (Pareto, 1906)
- However in reality
  - Indecisive and heterogeneous agents face various constraints and biases
  - Non-optimal choices in economic and financial decisions (Agarwal, Chomsisengphet, and Lim, 2017)
  - Hurt financial sustainability
- Household financial sustainability
  - (imperfect) household economic and financial decisions
  - How to improve these decision making

Financial Sustainability-household financial and economic decisions

- Consumption response to (positive) income shocks
  - Traditional PIH and lifecycle hypothesis: household smooth consumption hence consumption will not vary unless long-term expectation on income has changed
  - Empirical studies document consumption responds excessively to even anticipated increase in income (Parker, 1999; Souleles, 1999; Souleles, 2002; Stephens Jr, 2003; Mastrobuoni & Weinberg, 2009)
    - Agarwal, Liu, and Souleles (2007): consumer spending increase after the 2001 federal income tax rebates
    - Agarwal, Marwell, and McGranahan (2017), Agarwal, Kang, and Qian (2022): individuals increase spending instead of merely substitution in anticipated temporal sales events

Financial Sustainability-household financial and economic decisions

- Potential explanation: liquidity constraint
  - No easy access to credit leads to excessive consumption response (Jappelli & Pagano, 1989)
  - Stephens Jr (2006): liquidity-constrained households increase nondurables and food consumption upon anticipated paycheck arrival
  - Significant spending increase in response to anticipated temporary tax rebates or stimulus is driven by liquidity-constrained households (Johnson, Parker, & Souleles, 2006; Agarwal, Liu, & Souleles, 2007; Shapiro & Slemrod, 1995, 2003, 2009; Agarwal, Marwell, & McGranahan, 2017)
  - Agarwal, Pan and Qian (2020): liquidity-constrained individuals more likely to increase spending upon turning the age when they are allowed to withdraw part of their pension savings
  - Vehicle loan payment and random stimulus payment can significantly boost consumption especially among the liquidity-constrained households (Stephens Jr, 2008; Parker, 2017)

Financial Sustainability-household financial and economic decisions

- Caveat of liquidity constraint
  - Cannot explain the significant decline of consumption in response to anticipated income decrease, which can be simply smoothed by saving.
  - Shea (1995): household consumption does not significantly change in response to anticipated wage increase but significantly decline in response to anticipated wage decrease
  - A series of studies document significant consumption drop after retirement (Banks, Blundell, & Tanner, 1998; Bernheim, Skinner, & Weinberg, 2001)

Financial Sustainability-household financial and economic decisions

- Consumption response to unanticipated income shocks
  - Studies document significant MPC out of (the announcement and receipt of) unanticipated (positive or negative) income shock, and most of them can be explained by PIH or life cycle hypothesis with liquidity constraint (Bodkin, 1959; Browning & Crossley; 2001; Agarwal & Qian, 2014; Di Maggio, et al., 2017).
  - Agarwal and Qian (2014): individual consumption increase significantly immediately following the announcement of an exogeneous unanticipated income increase.
  - Baker & Yannelis (2017), Gelman, et al., (2020): individuals decrease consumption in response to government shutdown.
  - Agarwal and Qian (2017): decreased access to home equity lead to negative consumption response.
  - Agarwal, et al., (2022): unanticipated interest rate decrease generates positive income shocks to mortgagors, resulting in significant increase in spending

Supporting Seniors*

- Insufficient retirement savings expose elderly individuals to financial vulnerability → governments consider support measures, e.g., direct fiscal transfers.

- We study the consumption response to the Silver Support Scheme, a means-tested elderly support program in Singapore.

Link to the paper:

SCAN ME

Main findings:

- Elderly individuals increase spending by 0.7 dollars per dollar of subsidy received.
- More liquidity-constrained recipients exhibit a higher MPC of 1, regardless of their income level. They also increase their spending immediately after the quarterly recurring subsidy payouts.
- No evidence of labor supply reduction or other strategic behaviors.

Implications for eligibility criteria, payment frequency, and distribution form in policy design.

*. Sumit Agarwal, Wenlan Qian, Tianyue Ruan, and Bernard Yeung (2021) Supporting Seniors: How Low-Income Elderly Individuals Respond to a Retirement Support Program. Working Paper

Financial Sustainability-household financial and economic decisions

- Household saving
  - Income uncertainties induce prudent consumers to defer consumption and increase precautionary saving (Carroll, Hall, & Zeldes, 1992; Carroll & Kimball, 1996; Carroll, 1997; Carroll, 2001)
    - Spending responses to losses are larger than gains (Christelis, et al., 2019; Fuster, Kaplan, & Zafar, 2021)
  - Skinner, & Zeldes (1995): low-income households choose not to save in order to remain eligible for social insurance programs
    - Financial products such as annuities and reverse mortgages can help households to hedge longevity risk, but they seem to be unpopular (Johnson, Burman, & Kobes, 2004)
  - Agarwal, et al., (2021): households decrease consumption through the deposit channel in response to an unanticipated interest rate hike

Financial Sustainability-household financial and economic decisions

- Under-participation in stock market: “Stockholding puzzle” or “non-participation puzzle”
  - All rational investors shall hold market portfolio (Merton, 1969); however, studies document a large fraction of households hold little risky asset
  - Fixed costs of participating in the stock market
    - Direct & indirect costs (Haliassos and Bertaut, 1995; Vissing-Jørgensen & Attanasio, 2003)
    - Guiso, Haliassos, & Jappelli (2003): stockownership rate is positively correlated with the level of household wealth and education
    - Cannot explain why a non-trivial fraction of wealthy households does not invest in the equity market
  - Trust: lack of trust result in limited participation in stock market
    - Guiso, Sapienza, & Zingales (2008): trust predicts investor stockholding decisions and the result is robust to the inclusion of individual risk and ambiguity aversion
    - Massa, et al., (2020): trust is positively associated with fund activeness

Financial Sustainability-household financial and economic decisions

- Under-diversification in investment
  - The main implication of mean-variance paradigm is that all investors should hold risky assets in the same proportion
  - Empirical evidence show significant undiversified household portfolio holding
    - Calvet, Campbell, and Sodini (2007): Swedish household on average holds a highly undiversified portfolio of very few stocks
  - Information advantage may lead to concentrated investments (Ivkovic, Sialm and Weisbenner, 2008; Korniotis and Kumar, 2013; Van Nieuwerburgh and Veldkamp, 2010)
  - Local bias may lead to concentrated investment in famalier stocks (Graham, Harvey and Huang, 2009; Grinblatt and Keloharju, 2001)

Financial Sustainability-household financial and economic decisions

- Borrowing decisions: borrowers do not always choose deals that minimize their costs, even with the help of professional advisors
  - Agarwal et al., (2020): Low-FICO applicants with mandatory financial counselor review did not materially change their contract choice
  - Agarwal, Ben-David, and Yao (2017): borrowers overestimates how long they will stay with a mortgage and choose mortgage points contract which brings higher losses
  - Agarwal et al., (2015): A substantial fraction of consumers (about 40%) chose the suboptimal contract for credit card offers.
  - Agarwal et al., (2009): payday loan borrowers have substantial credit card liquidity at the same time

Financial Sustainability-household financial and economic decisions

- Non-optimal borrowing decisions: possible reasons
  - High searching costs to understand the terms and conditions of the financial products (Hortaçsu & Syverson, 2004)
  - Present-biased borrowers tend to extract equity for consumption (Ausubel, 1991; Meier & Sprenger, 2010), or borrow high-interest loans and fail to repay later, incurring unnecessary overdue costs and penalty fees (Agarwal, Skiba, & Tobacman, 2009; Stango & Zinman, 2009; Kuchler & Pagel, 2021)
  - Information overload (Bettinger, et al., 2012)
  - Anchoring effect (Kahneman & Tversky, 1974; Keys & Wang, 2019; Marx & Turner, 2018; Cox, Kreisman, & Dynarski, 2020)

Financial Sustainability-household financial and economic decisions

- Payment: for borrowers with multiple credit card debts, the optimal behavior is to make the minimum required payments on all the cards and repay the card debt with a higher interest rate.
  - Most households do not follow the optimal repayment sequence, leading to higher financial costs together with liquidity on the table (Grubb, 2014; Ponce, Seira, & Zamarripa, 2014; Stango & Zinman, 2014; Gathergood, Mahoney, Stewart, & Weber, 2019)
  - Credit card debt puzzle: households revolve credit card debt and hold liquid assets at the same time (Gross & Souleles, 2002)

Financial Sustainability-household financial and economic decisions

- Heterogeneity in household financial decisions: households differ in ability to make optimal choices
  - (High income and education) households can efficiently allocate their debt repayment (Becker & Shabani, 2010; Stango & Zinman, 2016)
  - Aaronson et al., (2019): job loss lead to worse credit conditions to only low-earners but not high-earners
  - Agarwal, Chomsisengphet, and Zhang (2017): borrowers with higher financial literacy are less likely to default
- Agarwal et al., (2016): the condominium loan borrowers, who are more likely to be investor borrowers, default more in early stage of financial crisis
- Agarwal et al., (2015): financial literacy and tendencies vary across demographic and socioeconomic groups
- Agarwal and Mazumder (2013): consumers with higher cognitive ability, especially math scores, are less likely to make financial mistakes

Financial Sustainability-household financial and economic decisions

- Strategic behavior of credit providers: credit providers may intentionally steer customers towards more expensive products (Agarwal, Amromin, Ben-David, & Evanoff, 2016)
  - Sales tactics that just highlight the benefits but hide the costs of a product (Gabaix & Laibson, 2006; Stango & Zinman, 2011, 2014; Agarwal, et al., 2015; Gurun, Gregor, & Seru, 2016; Agarwal, Song, & Yao, 2019)
  - Junk mails can influence customer choice (Agarwal & Ambrose, 2016)
  - Agarwal, Sujit, & Lunn (2010): a small incentive such as a 1% cash back reward can significantly boost spending and debt accumulation
  - How the loan application is designed can also influence one's decision through framing bias (Pallais, 2015; Abraham, Filiz-Ozbay, Ozbay, & Turner, 2020)
  - Agarwal and Bos (2019): alternative credit markets exploit creditworthy borrowers by charging them high fees and interest rates

Financial Sustainability-household financial and economic decisions

- Strategic behavior of borrowers
  - Agarwal et al., (2019): senior debt servicers prefer to delay liquidation and preserve their option value when they are also junior lien owners
  - Agarwal, Ben-David, and Yao (2015): financially constrained borrowers tend to influence the appraisal process in order to increase borrowing or reduce the interest rate
  - Agarwal, Chomsisengphet, and Liu (2010): lower-credit quality consumers respond to lender's inferior solicitation offers, suggesting adverse selection
  - Agarwal, Chomsisengphet, and Mielnicki (2008): Reinstated credit card accounts are likely to default again.
  - Agarwal (2007): average homeowner overestimates house value; homeowners who "rate refinance" an existing loan to increase lifetime savings tend to underestimate their house value, while homeowners who "cash-out refinance" an existing loan to fund current consumption tend to overestimate their house value
  - Ambrose, Agarwal, and Liu (2006): borrowers with higher expectations of future credit quality deterioration originate credit lines to preserve financial flexibility
  - Agarwal et al., (2020): borrowers who search a lot obtain more expensive mortgages; risky borrowers internalize the probability that their application is rejected, and behave as if they had higher search costs

Financial Sustainability-household financial and economic decisions

- Relationship lending and soft information
  - Relationship lending may lead to negative outcomes
    - Agarwal et al., (2021): credit card providers give higher credit lines and debt forgiveness to government bureaucrats as hidden bribes
  - More available soft information may result in better performance of relationship accounts
    - Agarwal, Ambrose, and Yao (2020): banks steer lower risk borrowers to the piggyback loans to circumvent the cost of primary mortgage insurance (PMI).
    - Agarwal and Ben-David (2018): Incentives on loan volume lead to unfavorable soft information being overlooked in the origination process.
    - Agarwal et al., (2018): relationship accounts exhibit lower probabilities of default and attrition, and have higher utilization rates
    - Agarwal et al., (2011): interactions between borrower and lender generates soft information which effectively reduce overall portfolio credit losses

Financial Sustainability-household financial and economic decisions

- Influence of behavioral factors
  - Mood affects individual behaviors including consumption, tipping, and investment (Hirshleifer and Shumway, 2003; Agarwal, et al., 2020; Zhang and Tan, 2021; Li, et al., 2021)
  - Agarwal, Bubna, and Lipscomb (2021): mental accounting lead to more spending following credit card statement date
  - Individuals are impatient and lack self-control under hyperbolic preference, which can explain anomalies such as undersaving and a sharp consumption decline at retirement (Laibson, 1998).
    - Individuals may accumulate illiquid assets as a form of commitment to avoid biases (Laibson, 1997)
  - Overconfidence induces excess trading and lower return (Barber and Odean, 2000; Grinblatt & Keloharju, 2009)

- Loss aversion can lead to disposition effect in stock investment, where investors tend to sell winners and keep losers (Shefrin and Statman, 1985; Ivkovic and Weisbenner, 2009; Kaustia, 2010; Ben-David and Hirshleifer, 2012, Barberis and Xiong, 2012; Hirshleifer 2015).
- Agarwal et al., (2009): foreign investors generally underperform domestic investors in Indonesia stock market due to aggressive trading behavior
- Individuals adjust labor supply according to a reference (income) point (Agarwal, et al., 2015; Li, et al., 2021; Duong, Chu, and Yao, 2022)
- Present-biased borrowers are more likely to accept back-loaded mortgages that minimize up-front costs, even though this increases their risk of going "underwater" and entering default
- Agarwal et al., (2015): initial collateral remains an important predictor of mortgage default due to sunk cost fallacy
- Agarwal et al., (2011): strong brokerage firm effect on herding in the Indonesian stock market, likely driven by acting on common information
- Agarwal, Liu, and Rhee (2008): pre-offering demand for IPOs is partly driven by investors' over- or underreactions to information about firms' post-issuance prospects

Financial Sustainability-household financial and economic decisions

- Influence of peers
  - Hong, Kubik and Stein (2004): Individuals are more willing to participate in the stock market if their peers are also stock market participants
  - Agarwal, Qian, and Zou (2021): large negative income shock from peer's personal bankruptcy significantly reduce the consumption of the same-building neighbors
  - Agarwal, Mikhed, and Scholnick (2020): lottery-winning of peers increase subsequent borrowing and bankruptcy among other neighbors
  - Agarwal et al., (2011): more aggressive mortgage products had significant negative spillovers on subprime lending-concentrated neighborhood, but does not lead to greater default risks among them

Financial Sustainability- Ways to improve household financial sustainability

- Learning
  - A leading explanation for suboptimal financial decisions is the lack of financial literacy; some education programs do improve behavior and outcomes of the graduates (Agarwal et al., 2011)
  - households improve their decisions as they acquire more experience (Miravete, 2003; Agarwal, Driscoll, Gabaix and Laibson, 2008; Agarwal, Chomsisengphet, Liu, & Souleles, 2015)
  - when the memory fades, one can make mistakes again (Haselhuhn, Pope, Schweitzer, & Fishman, 2012)

Financial Sustainability- Ways to improve household financial sustainability

- Reminders, information disclosure, and regulations on household side
  - Technologies that timely remind consumers may help them reduce unnecessary fees, but may also lead to an increase in spending and other types of fees (Fernandes, Lynch, & Netemeyer, 2014; Carlin, Jiang, & Spiller, 2017; Medina, 2021)
    - Agarwal and Karapetyan (2022): by reducing the mispricing of housing units with hidden debt, the increased salience of debt benefited homebuyers
  - Simply nudge may not work effectively to reduce credit card debt (Agarwal et al., 2015; Keys and Wang, 2019)
  - Agarwal et al., (2017): higher minimum payments and cash advances restrictions in credit card policy impose soft liquidity constraints in credit card holders which decreases spending and debt

Financial Sustainability- The power of government policy and FinTech

- Improve access to credit
  - Agarwal, Mukherjee, and Naaraayanan (2022): Roads connecting rural villages leads to large private bank financing
  - Agarwal, et al. (2022): microcredit expansion program can play a critical role in screening unbanked borrowers, allowing them to build a credit history and facilitating their transition to commercial banks
  - Agarwal, et al., (2022): HARP policy which relaxed housing equity constraints by extending government credit guarantee on insufficiently collateralized mortgages refinanced by intermediaries leads to more refinancing, interest saving, durable spending, and faster recovery of house prices

Financial Sustainability- The power of government policy and FinTech

- Regulating credit providers
  - Agarwal, et al., (2021): agency problem among sole brokers can be mitigated by the consolidated financial requirement for occupational licensing; they respond by applying a more stringent screening hence achieving better loan performances.
  - Dodd-Frank Act:
    - Agarwal, et al., (2021): risk retention rule requiring 5% of underlying credit risk for commercial MBS curtailed credit growth in the commercial real estate market
    - Agarwal et al., (2018): banks delay foreclosure of delinquent mortgages in districts of committee members

- CARD Act effectively reduced borrowing costs without incurring higher interest rate or reduction in credit supply (Agarwal, et al., 2015; Agarwal, et al., 2014)
- Agarwal et al., (2014): federal and state regulators implement identical rules inconsistently due to differences in their institutional design and incentives.
- Agarwal et al., (2009): mandatory third-party review of mortgage contracts by financial counselors reduces default rate and pushed some borrowers to choose less risky loan products
- Agarwal et al., (2022): Community Reinvestment Act (CRA) leads to risky lending

Financial Sustainability- The power of government policy and FinTech

- Interventions in real estate market
  - Agarwal, et al., (2021): a policy allowing for extra space adding to existing housing increases the resale price
  - Agarwal, Ambrose, and Yao (2020): Home Valuation Code of Conduct reduced inflated collateral valuations in refinance transactions, with the effect manifested in low-liquidity and low-distress markets.
  - Agarwal et al., (2020): A policy increases capital gains taxes for housing units with holding period less than 5 years in China significantly boosted the tax evasion, particularly driven by financing buyers
  - Agarwal and Zhang (2018): a government bailout which injects liquidity to mortgage servicers significantly increased the loan modification rate
  - Agarwal et al., (2017): HAMP that provided intermediaries with sizeable financial incentives to renegotiate mortgages. HAMP increased intensity of renegotiations and prevented substantial number of foreclosures but reached just one-third of its targeted indebted households

Financial Sustainability- The power of government policy and FinTech

- Information and data collection
  - Agarwal and Hauswald (2021): soft private information primarily underlies relationship lending which has higher interest rates but is more readily available, whereas hard public information drives transactional loans.
  - Agarwal, Chomsisengphet, and Liu (2016): less credit worthy applicant is more likely to select a credit contract that requires less collateral
  - Net linguistic tone (negative minus positive tone) in the S&P credit rating action reports is significantly and negatively related to abnormal returns and predicts future rating changes.
  - Agarwal et al., (2022): tones in sovereign credit rating reports contain valuable credit-related information beyond sovereign rating actions

Financial Sustainability- The power of government policy and FinTech

- New technology
  - A notable advantage of FinTech is the ability to use big data to assess credit risk more intelligently and create a more diverse and stable credit sector
    - Mobile phone usage behavior can generate alternative credit scores and potentially reduce the cost of financing (Bjorkegren and Grissen, 2018)
    - Incorporating digital footprint variables (i.e. logging in social media platform) can introduce substantial improvement in the predictive power for defaults (Berg et al., 2018; Agarwal et al., 2019)
    - The inclusion of social network or third-party guarantee at P2P lending, are also shown to be effective in alleviating the information asymmetries and results in lending efficiency (Jin and Freedman, 2014; Agarwal et al., 2015; Agarwal and Zhang, 2020 provides a review)

- FinTech lending can enhancing lending efficiency, financial inclusion and potentially reduce consumer's financial distress (i.e. Agarwal, et al., 2018; Keys, Mahoney, & Yang, 2020)
  - Technology-oriented approach allows FinTech lenders to process applications 20% quicker without increasing loan risk (Fuster, et al., 2019)
  - Can provide better access of credit to unbanked or minority groups (Bartlett et al., 2019)
  - FinTech has automated investment advice at low costs and low account minimums, which facilitates consumers' access to professional finance advice (Abraham Schmukler and Tessada, 2019; D'Acunta, Prabhala and Rossi, 2019)
- Convenience of new technology changed habits of consumers
  - Introduction of a new mobile payment technology encourages consumer spending and entrepreneurship growth, and reshapes economic activities (Agarwal, et al., 2019; Agarwal, et al., 2020; see Agarwal and Chua (2020) for a review) .
  - Privacy leakage just lead to a short-term decrease in digital payments (Agarwal, et al., 2021)

Privacy versus Convenience*

CYBERSECURITY RISKS!!

We study how consumers make trade-off between convenience and privacy from their behaviors in multiple unexpected data breaches in India.

- Unexpected data breach on a leading food delivery platform
  - Users converted from digital payment to cash, but only in the short run
  - Entry of new users declines mildly with little change in composition
  - No change in exit of existing users. Digital users exit less but switch to cash.
  - Little PR or promotion campaign by the breached firm
- Bank and online grocery data breaches: weak effects
- Weak spillover effects

Link to the paper:

SCAN ME

*. Sumit Agarwal, Pulak Ghosh, Tianyue Ruan, and Yunqi Zhang (2022) Privacy versus Convenience: Customer Response to Data Breaches of Their Information. Working Paper

Announcement