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เศรษฐศาสตร์พฤติกรรม
(Behavioral Economics)

เศรษฐศาสตร์พฤติกรรมและการกำหนดนโยบายด้านภาษี

ธเนศพงศ์ ช่วงประยูร
เศรษฐกรปฏิบัติการ ส่วนนโยบายภาษีสรรพสามิต
สำนักงานเศรษฐกิจการคลัง
กระทรวงการคลัง

เศรษฐศาสตร์พฤติกรรมและการกำหนดนโยบายภาษี

หลักการ การศึกษาต่างประเทศ และการประยุกต์ใช้

Outline

INTRODUCTION

- Human Thinking
- Behavioral Games

THEORY / PRINCIPLES

- Objectives
- Behavioral Change Matrix

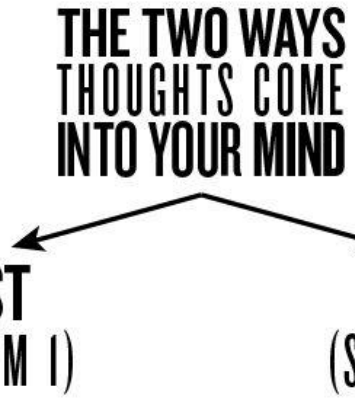
INTERNATIONAL RESEARCH

- Tax Compliance
- SinTax

APPLICATION

- Prelim Study of Sugar Sweetened Beverages Taxation

ทำไมต้องพฤติกรรม?



Autopilot System

- Fast, intuitive, emotional self
- Requires no effort
- Automatic thinking, feeling, and behavior habits
- Mostly makes good decisions, 80% of time
- Prone to some predictable and systematic errors

- **Automatic** - you don't have to do anything actively
- Operates on the now
- Forms stereotypes based on previous experience
- Creates bias by quick reactions
- An emotional response

- Needs mental effort and several steps to retrieve information
- Demands attention and effort
- Biases influence "rational decisions"
- When system 2 is at work, self control goes down

Intentional System

- Conscious, reasoning, mindful self
- Takes intentional effort to turn on
- Drains mental energy
- Used mainly when we learn new information, and when we use reason and logic
- Can be trained to turn on when it detects Autopilot System may be making error

Source: https://www.pinterest.com/PeterBurow/

ทดสอบ Rationality

Centipede Game

SESSION NAME: tjmn5

http://veconlab.econ.virginia.edu/login1.php

Centipede Game

- **Rounds and Matchings**: This experiment consists of a number of **rounds**. Note: You will be matched with the **same** person in all rounds. The number of rounds is: **10**.
- **Interdependence:** Your earnings are determined by the decisions that you and the other person make. Each of you will be given the chance to make one or more decisions, **in alternating order**, until one person stops the process or until the final decision point is reached and the process is stopped automatically.
- **Roles:** In each pair of people, one person will make the initial decision. If this person does not stop the process, then the other person will make the second decision. This person may stop the process, etc.
- **Payoffs:** Press Continue to see the table of payoffs on the next page.

Payoffs for **Player A**, **Player B**

A		B		**A**		B		**A**
○ **Continue** ○ **Stop**	>>	Continue Stop	>>	**Continue** **Stop**	>>	Continue Stop	>>	**Automatic Stop**
$0.40 for A $0.10 for B		**$0.20 for A** $0.80 for B		**$1.60 for A** $0.40 for B		**$0.80 for A** $3.20 for B		**$6.40 for A** $1.60 for B

- **Your Decision:** One person in each pair will be selected to make the first decision. This person will be called player A, and the two small circles or "radio buttons" on the left side of the above table correspond to the adjacent decision, **Stop** or **Continue**. If player A decides to Stop, then the payoffs will be **$0.40** for Player A and **$0.10** for Player B.
- **To Continue:** At this time, suppose that you have the Player A role. Please mark a decision, Stop or Continue, and press the Submit Button below to go to the next page.

Submit Decision

Centipede Game

- Since you selected **Continue**, Player B would see a table with radio buttons next to the two decisions, **Continue** or **Stop**, as shown below in the second column from the left. Now think of yourself as being in the role of Player B making the second decision, with your decisions and payoffs shown in the light blue font:

Payoffs for **Player A**, **Player B**

A		B		A		B		A
Continue Stop	>>	○ **Continue** ○ **Stop**	>>	Continue Stop	>>	**Continue** **Stop**	>>	Automatic Stop
$0.40 for A $0.10 for B		$0.20 for A **$0.80 for B**		$1.60 for A **$0.40 for B**		$0.80 for A **$3.20 for B**		$6.40 for A **$1.60 for B**

- If you had selected **Stop**, Player B would have no decision to make and would see a table like the one below, where the payoffs are shown at the bottom left under the **Stop** decision. All of the payoffs in the subsequent columns are no longer relevant, and are shown in gray. The round would end at this point, and earnings would be added to your cumulative earnings.

A		B		A		B		A
Continue **Stop**	>>	Continue Stop	>>	**Continue** **Stop**	>>	Continue Stop	>>	**Automatic** **Stop**
$0.40 for A **$0.10 for B**		$0.20 for A $0.80 for B		$1.60 for A $0.40 for B		$0.80 for A $3.20 for B		$6.40 for A $1.60 for B

- **Matchings:** Please remember that you will be matched with a **different** person in each round, and you will not be matched with the same person more than once.
- **Decisions:** In each round, you and the person you are matched with will make **Stop** or **Continue** decisions in alternating order until one of you chooses to stop, or until the final **Automatic Stop** stage is reached.
- **Order of Decisions:** The roles (Player A who moves first, or Player B who moves second) have been determined, and your role is that of a first mover, which will stay the same in all rounds.
- **Order of Decisions:** The roles (Player A who moves first, or Player B who moves second) have been determined, and your role is that of a first mover, which will stay the same in all rounds.
- **Earnings:** Your earnings are determined by the pair of payoffs in effect when the process is stopped. Earnings in each round will be added to your previous total. You will be paid your total earnings from all 10 rounds at the end of the final round.
- **Rounds:** There will be **10 rounds**, and you are matched with a different person in each new round.

ทดสอบ Rationality

Trust Game

SESSION NAME: tjmn6

http://veconlab.econ.virginia.edu/login1.php

Trust Game

- **Rounds and Matchings**: The experiment consists of a number of **rounds**. Note: You will be matched with the **same** person in all rounds.
- **Interdependence:** The decisions that you and the other person make will determine the amounts earned by each of you.
- **Pass/Keep Decisions:** One of you will be designated to move first, and that person will begin by receiving a specified amount of money **$10.00**. The **first mover** will decide how much money (if any) to pass on to the other person and how much (if any) to keep. All money passed gets multiplied by **3** before it is received by the **second mover**, who then decides how much (if any) to keep and how much (if any) to pass back to the first mover. These pass/keep decisions determine earnings for the round, as explained below.
- **Role:** You have been randomly assigned to be a **first mover**, and you will begin each round with an amount of money, **$10.00**. You will decide how much to keep and how much to pass. All money that you pass to the second mover is multiplied by **3**, and the second mover then decides how much of this to pass back to you.
- **Earnings from Pass/Keep Process:** You earn the amount kept initially plus the amount that is passed back by the second mover. The second mover earns the amount kept at this stage.
- **Cumulative Earnings:** The program will keep track of your total earnings for all rounds, and these will be shown as "cumulative earnings" on a results page.
- **Matchings:** Please remember that you will be matched with the **same** person in all rounds.
- **Decisions:** The first mover begins each round with **$10.00** and must decide how much (if any) to keep and how much (if any) to pass. What is passed gets **tripled** before being received by the second mover. The second mover in each pair then decides how much (if any) to keep and how much (if any) to pass back.
- **Earnings:** The first mover earns the amount kept initially plus the amount passed back. The second mover earns the amount kept in the second stage.
- **Rounds:** There will be a number of rounds, and you are always matched with the same person.

When prompted, enter the amount that you wish to pass, between $0.00 and $10.00. The remainder is what you keep. What is passed gets **multiplied by 3** before being received by the second mover, who will decide how much (if any) to pass back.

Round	Amount Kept	Amount Passed	Amount Passed Back	Round Earnings	Total Earnings
1		please choose ▾ Submit Decision		*	*

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ความสำคัญ

NUDGE

Libertarian Paternalism
(Choice Architect)

TAX POLICY:
- Raising Revenues
- Policies to 'correct' Behavior
- Redistribution of Income
- Minimizing Fraud and Error

Source: http://www.ucl.ac.uk/~uctpimr/research/IFScomm125.pdf

Behavioral Insights

Bounded Rationality
- Heuristics

Temptation
- Self Control

Framing
- Mental Accounting

Prospect Theory
- Loss Aversion

Social Preferences
- Conforming to Social Norms

Time Inconsistency
- Procrastination

Source: http://www.ucl.ac.uk/~uctpimr/research/IFScomm125.pdf

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Raising Revenues

Bounded Rationality

Framing

Time Inconsistency

Social Preferences

Suggestion

Source: http://www.ucl.ac.uk/~uctpimr/research/IFScomm125.pdf

เศรษฐศาสตร์พฤติกรรมและการกำหนดนโยบายภาษี

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Corrective Taxation

Source: http://www.ucl.ac.uk/~uctpimr/research/IFScomm125.pdf

- **Time Inconsistency**
- **Bounded Rationality**
- **Framing**
- **Prospect Theory**
- **Social Preferences**

Suggestion

เศรษฐศาสตร์พฤติกรรมและการกำหนดนโยบายภาษี

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Redistribution

Bounded Rationality

Framing

Time Inconsistency

Social Preferences

Suggestion

Source: http://www.ucl.ac.uk/~uctpimr/research/IFScomm125.pdf

เศรษฐศาสตร์พฤติกรรมและการกำหนดนโยบายภาษี

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Tax Compliance

Bounded Rationality

Social Preferences

Prospect Theory

Suggestion

Source: http://www.ucl.ac.uk/~uctpimr/research/IFScomm125.pdf

Other Intervention

- **Regulation**
- **Information Provision**
- **Nudging**
- **De-Biasing**

Source: http://www.ucl.ac.uk/~uctpimr/research/IFScomm125.pdf

Neuroeconomics

Detection of social stimuli
(e.g., presence of other people, their identities and gaze directions)

Amygdala, temporal visual cortex (e.g., FFA)

↓

Formation of meta-representation
(e.g., representing what other people think of us)

mPFC, TPJ

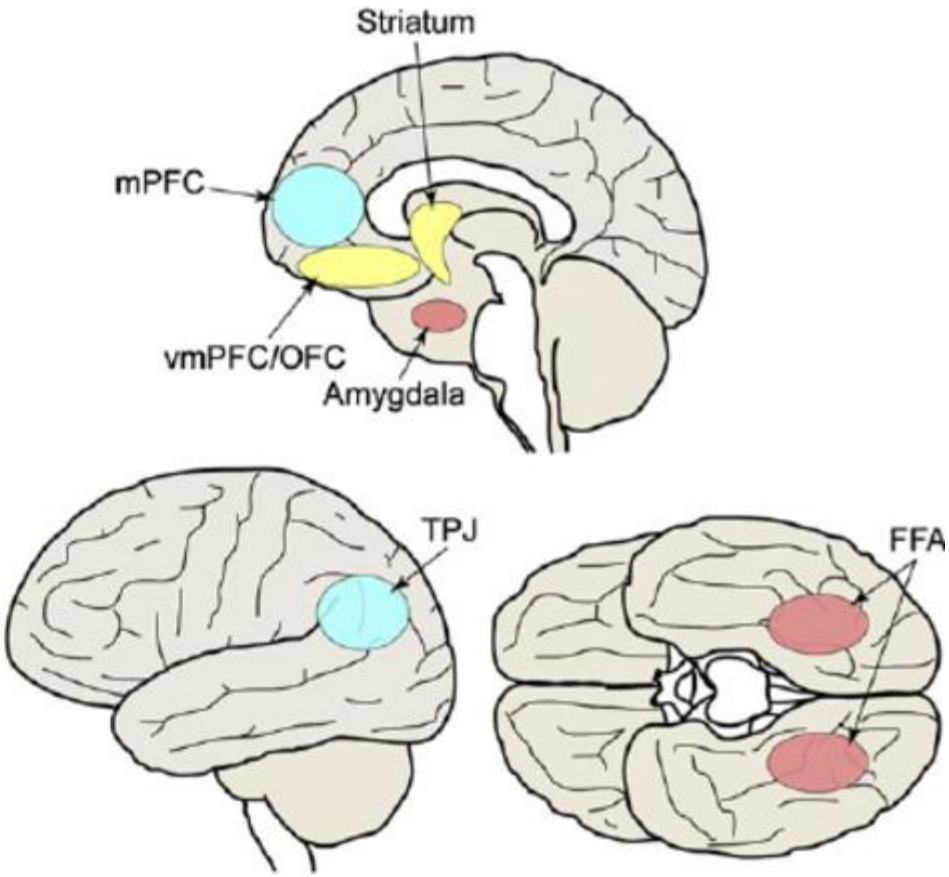
↓

Cost-benefit analysis of possible actions using a common currency

Striatum, vmPFC/OFC

↓

Social behavior
(e.g., pro-social or altruistic acts)



Source: Researchgate.net

How bout you?

Survey

https://goo.gl/forms/0haAcalogm8P9YgL2

Tax Compliance

Tax Revenue and Tax Rates in Scandinavia versus Selected Comparison Countries

	Denmark	*Norway*	*Sweden*	*Germany*	*United Kingdom*	*United States*
Tax revenue /GDP	48.2%	42.8%	45.8%	36.3%	35.0%	24.8%
Shares of tax revenue						
Income taxes	64.2%	70.7%	68.4%	68.7%	54.8%	70.0%
Property taxes	3.8%	2.9%	2.4%	2.4%	11.8%	12.2%
Consumption taxes	31.6%	26.4%	28.8%	28.4%	32.8%	17.9%
Income tax distortions						
Top marginal tax rate	69.8%	60.8%	73.6%	59.3%	62.7%	43.3%
Participation tax rate	87.0%	77.6%	76.7%	63.0%	55.6%	36.6%

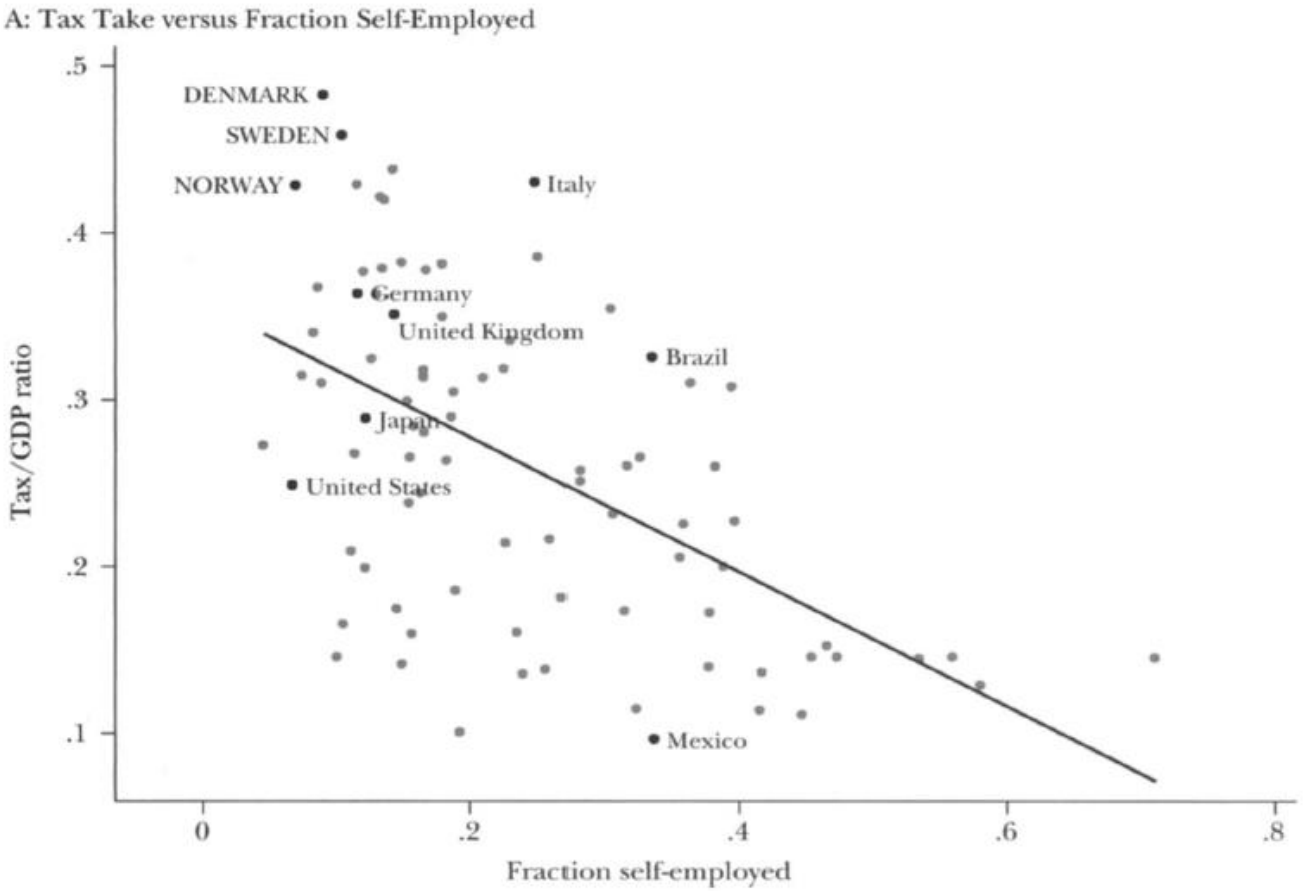
p. 78

How Can Scandinavians Tax So Much?

Source: Kleven, H. J. (2014). How Can Scandinavians Tax So Much? Journal of Economic Perspectives,28(4), 77-98. doi:10.1257/jep.28.4.77

Tax Compliance

How Can Scandinavians Tax So Much?



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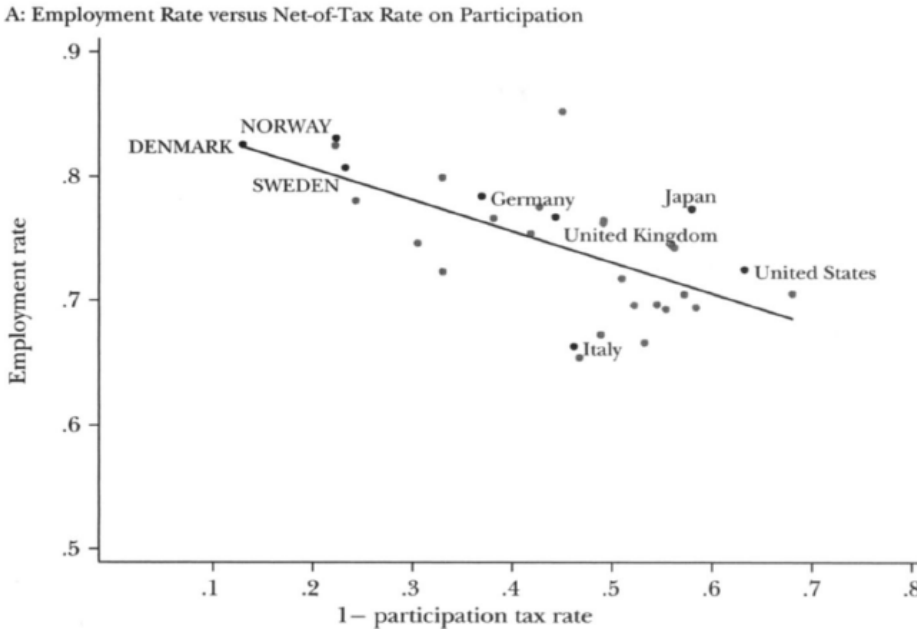
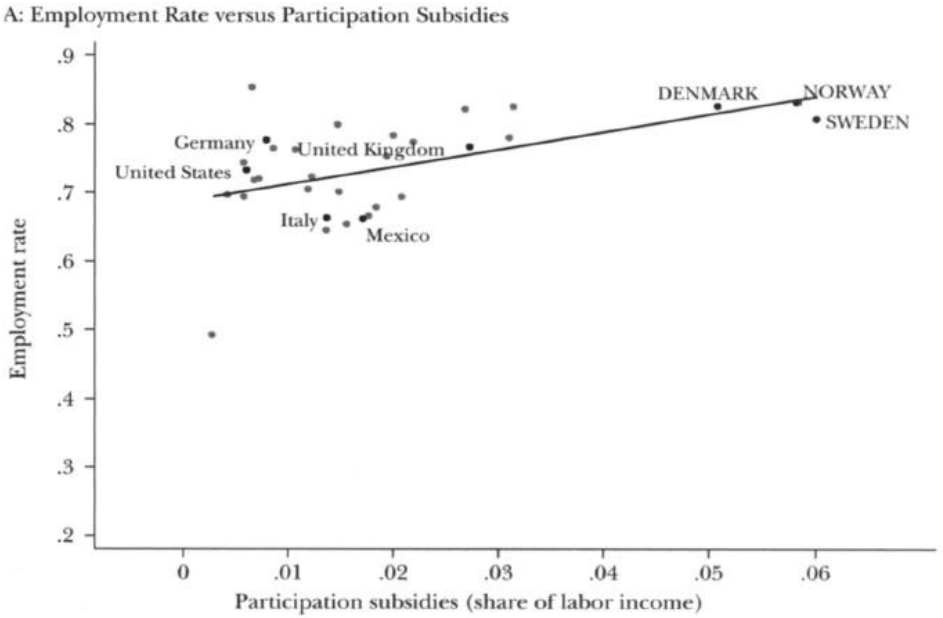
Tax Compliance

How Can Scandinavians Tax So Much?





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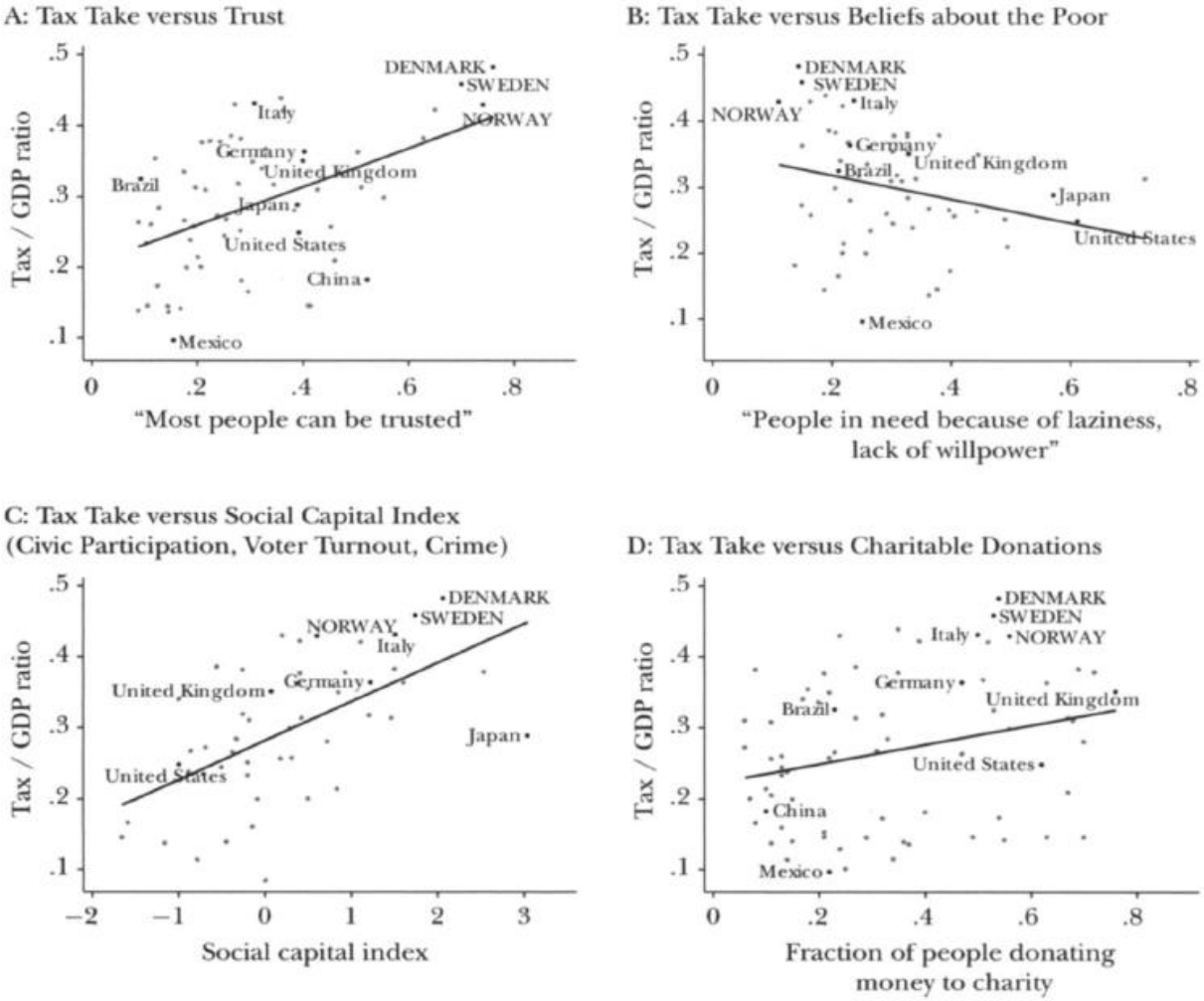

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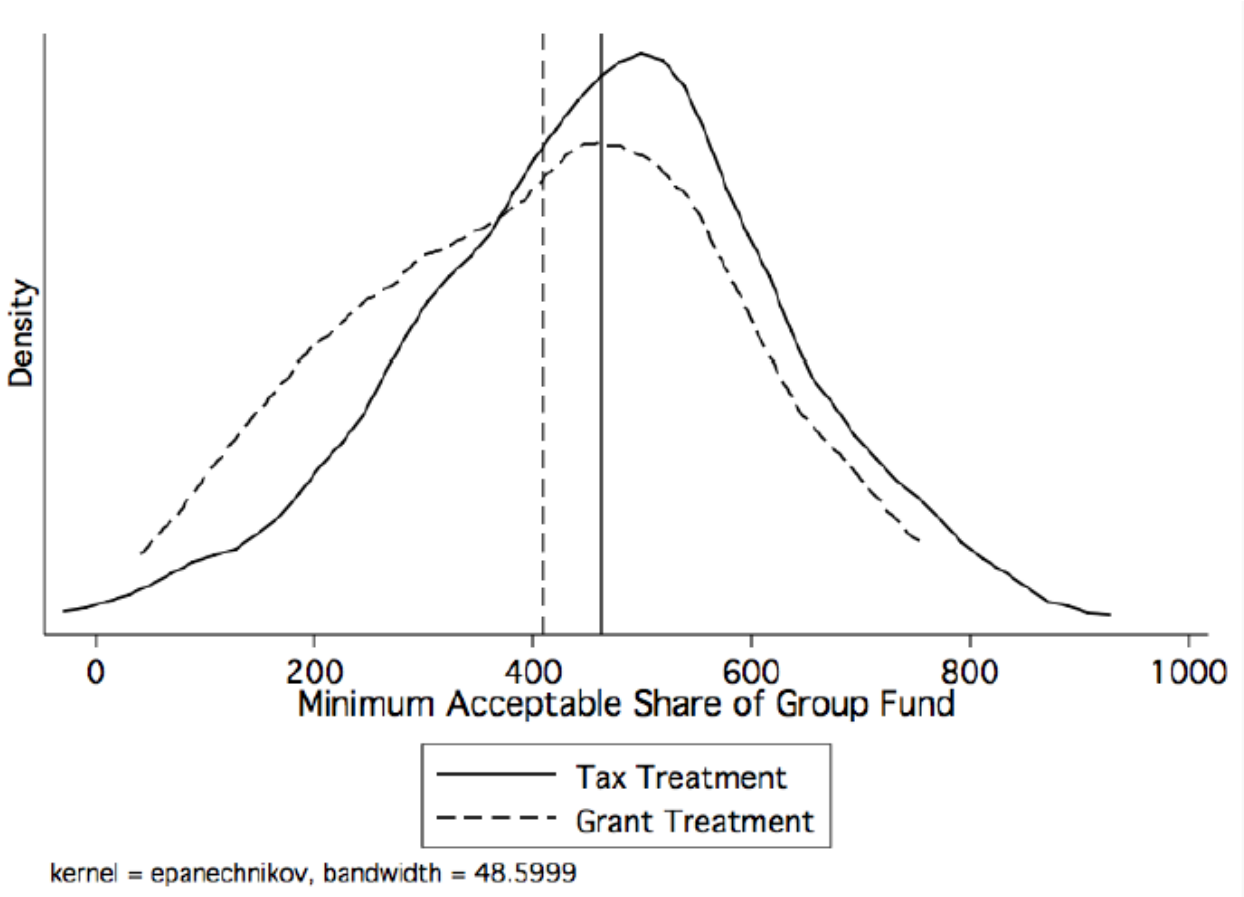
Tax Compliance *Experimental Evidence for Taxation's Effect on Citizen Behavior*

STAGES	Tax Game	Grant Game
1.	The Citizen is given a wage of 10 MU.	The Citizen is given a wage of 5 MU.
2.	The Citizen is taxed 5 MU - this is doubled to 10 MU and given to the Leader as the group fund.	The Leader is given 10 MU as the group fund.
3.	The Leader allocates the 10 MU between himself and the Citizen.	
4.	The Citizen observes the Leader's decision and decides whether to pay 1 MU to have enumerators remove 4 MU from the Leader.	

Source: Martin, L. (2014). Taxation, Loss Aversion, and Accountability: Theory and Experimental Evidence for Taxation's Effect on Citizen Behavior. https://sites.duke.edu/2014bmp/files/2014/10/Martin_TaxAcc.pdf

Tax Compliance *Experimental Evidence for Taxation's Effect on Citizen Behavior*



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Tax Compliance *Experimental Evidence for Taxation's Effect on Citizen Behavior*

Stages	Tax Game with 3PP	Grant Game with 3PP
1	Citizen receives a wage of 10 MU; Observer receives a stake of 5 MU.	Citizen receives a wage of 5 MU; Observer receives a stake of 5 MU.
2	Citizen is taxed 5 MU; this is doubled and passed to the Leader as the group fund.	The Leader is given 10 MU as the group fund.
3	The Leader allocates the 10 MU between himself and the Citizen.	
4	The Observer sees the Leader's decision and decides whether to pay 1 MU to have enumerators remove 4 MU from the Leader (no one receives the money taken in punishment).	

Source: Martin, L. (2014). Taxation, Loss Aversion, and Accountability: Theory and Experimental Evidence for Taxation's Effect on Citizen Behavior. https://sites.duke.edu/2014bmp/files/2014/10/Martin_TaxAcc.pdf

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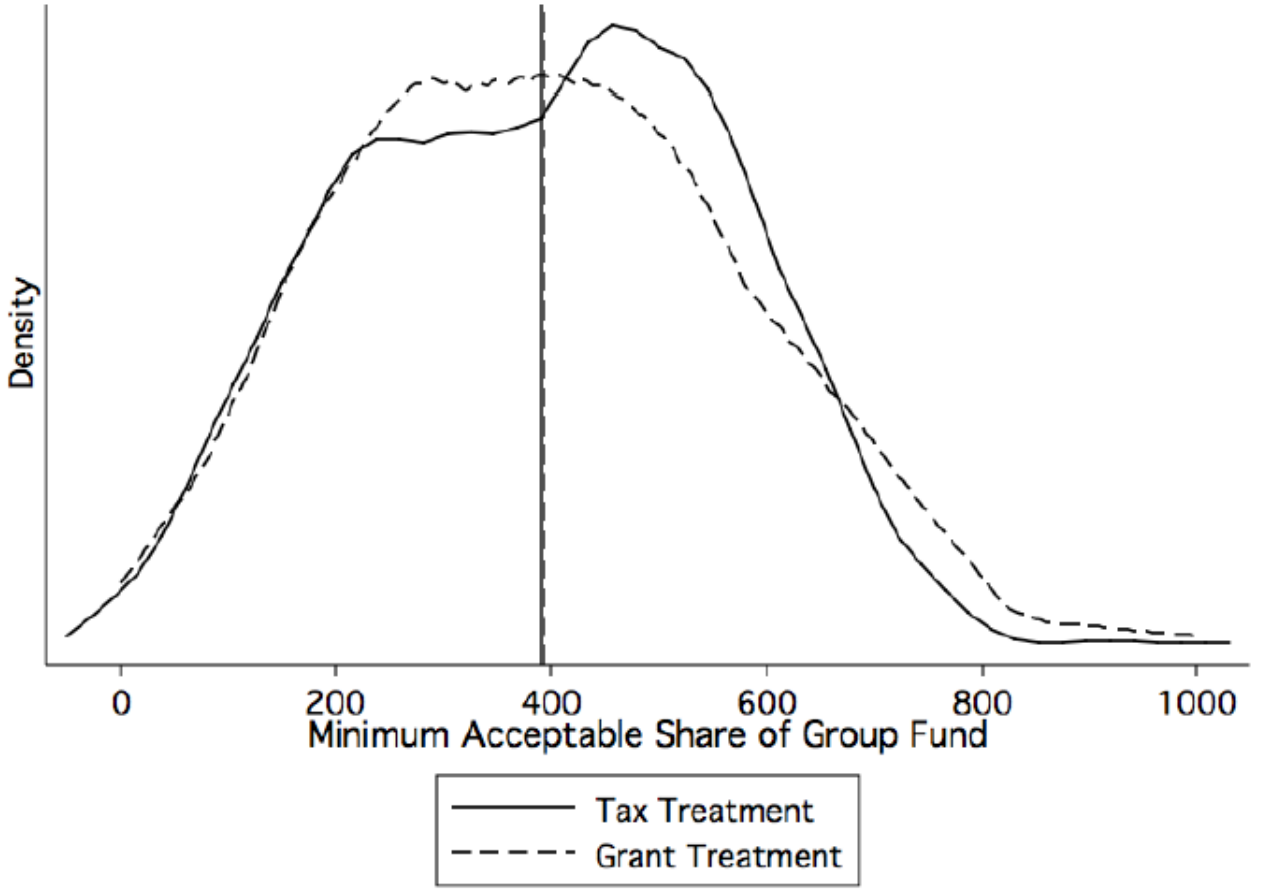

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Tax Compliance *Experimental Evidence for Taxation's Effect on Citizen Behavior*

Attribute	Possible levels
The official was	Elected by the citizens; Appointed by the government
The official was a member of	Local Government; National Government
The official spent the money on:	Himself; His kin and village; Buying election support for his party
The money should have gone to:	Health; Education; Roads or other infrastructure; Water and sanitation; Government Salaries
The official stole money from:	Citizen's taxes; Foreign Donors; Transfers from Central to Local Government

	Official A	Official B
Is an	Elected official	Appointed official
Is part of the	Local government	National goverment
Stole money that should have gone to	Education	Education
Spent the money on	Himself and his family	Election support for his party.
Is accused of stealing money from	Citizen's taxes	Foreign donors

Source: Martin, L. (2014). Taxation, Loss Aversion, and Accountability: Theory and Experimental Evidence for Taxation's Effect on Citizen Behavior. https://sites.duke.edu/2014bmp/files/2014/10/Martin_TaxAcc.pdf

Tax Compliance — *The Behavioralist as Tax Collector*

www.hmrc.gov.uk

Date of issue 4 August 2011
Reference REFERENCE NUMBEF

Dear Sir/Madam

Please pay £999999999999.99

Our records show that your Self Assessment tax payment is overdue.

It is easy to pay. Please call the phone number above to pay by debit card, credit card, or Direct Debit.

You can also pay using internet and telephone banking. For more information on when and how to pay, go to **www.hmrc.gov.uk/payinghmrc**

If you don't believe that this payment is overdue, please contact us on the number above.

If you have already paid, thank you. If not, please act now.

www.hmrc.gov.uk

Date of issue 4 August 2011
Reference REFERENCE NUMBER

Dear Sir/Madam

Please pay £999999999999.99

Our records show that your Self Assessment tax payment is overdue.

Nine out of ten people pay their tax on time.

It is easy to pay. Please call the phone number above to pay by debit card, credit card, or Direct Debit.

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If you don't believe that this payment is overdue, please contact us on the number above.

If you have already paid, thank you. If not, please act now.

Source: Hallsworth, Michael & List, John A. & Metcalfe, Robert D. & Vlaev, Ivo, 2017. "The behavioralist as tax collector: Using natural field experiments to enhance tax compliance," Journal of Public Economics, Elsevier, vol. 148(C), pages 14-31

Tax Compliance — *The Behavioralist as Tax Collector*

Group name	Test phrase	N	Debt value	Mean debt value	Mean Age	% Male
Control		17,038	£49,555,210	£2,908.51	49.33	73.61
Basic norm	*Nine out of ten people pay their tax on time.*	17,026	£47,923,291	£2,814.71	49.38	73.53
Country norm	*Nine out of ten people in the UK pay their tax on time.*	16,926	£46,688,514	£2,758.39	49.37	73.31
Minority norm	*Nine out of ten people in the UK pay their tax on time. You are currently in the very small minority of people who have not paid us yet.*	16,515	£46,415,638	£2,810.51	49.52	72.96
Gain-framed public good	*Paying tax means we all gain from vital public services like the NHS, roads, and schools.*	16,807	£47,640,777	£2,834.59	49.37	75.00
Loss-framed public good	*Not paying tax means we all lose out on vital public services like the NHS, roads, and schools.*	17,159	£48,875,216	£2,848.38	49.37	75.26

Source: Hallsworth, Michael & List, John A. & Metcalfe, Robert D. & Vlaev, Ivo, 2017. "The behavioralist as tax collector: Using natural field experiments to enhance tax compliance," Journal of Public Economics, Elsevier, vol. 148(C), pages 14-31

Tax Compliance *The Behavioralist as Tax Collector*

	(I) Pay tax	(II) Pay tax	(III) Pay tax	(IV) Pay tax
Basic norm	0.011**	0.012**	0.013**	0.013**
	(0.005)	(0.005)	(0.005)	(0.005)
Country norm	0.017***	0.017***	0.021***	0.021***
	(0.005)	(0.005)	(0.005)	(0.005)
Minority norm	0.035***	0.049***	0.038***	0.051***
	(0.005)	(0.006)	(0.005)	(0.006)
Gain-framed	0.013**	0.013**	0.016***	0.016**
public good	(0.005)	(0.005)	(0.005)	(0.006)
Loss-framed	0.013**	0.012**	0.016***	0.015**
public good	(0.005)	(0.005)	(0.005)	(0.005)
Age		0.005***		0.005***
		(0.0001)		(0.0001)
Male		-0.073***		-0.073***
		(0.004)		(0.004)
Debt size		2.37e-06***		2.24e-06***
		(0.000)		(0.000)
Remove early payers	No	No	Yes	Yes
N	101,471	99,033	98,748	96,354
Pseudo R^2	0.00	0.01	0.00	0.01

Notes: Our dependent variable is whether they started to pay or paid in full their outstanding tax within the 23 day period. The sample sizes are different in I vs II, and III vs IV because not everyone has data on age or gender.

Source: Hallsworth, Michael & List, John A. & Metcalfe, Robert D. & Vlaev, Ivo, 2017. "The behavioralist as tax collector: Using natural field experiments to enhance tax compliance," Journal of Public Economics, Elsevier, vol. 148(C), pages 14-31

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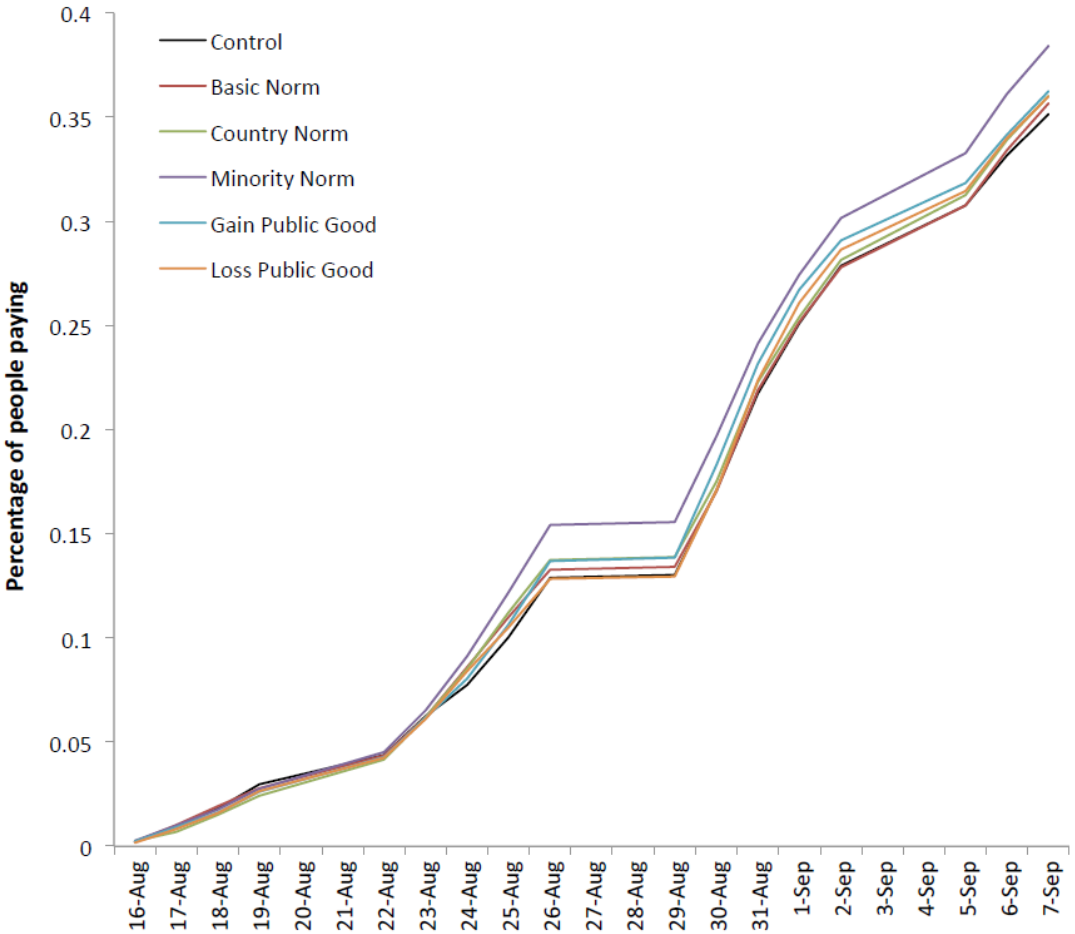

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Tax Compliance — *The Behavioralist as Tax Collector*

Group name	Test phrase	N	Debt value	Mean debt value	Mean Age	% Male
Control		8,558	£23,677,821	£2,766.75	50.51	71.91
General descriptive norm	The great majority of people in the UK pay their tax on time.	8,300	£22,984,178	£2,769.18	50.21	70.40
Local descriptive norm	The great majority of people in your local area pay their tax on time.	8,403	£23,592,768	£2,807.66	50.34	71.40
Debt descriptive norm	Most people with a debt like yours have paid it by now.	8,779	£24,836,091	£2,829.03	50.23	71.92
Local and debt descriptive norm	The great majority of people in your local area pay their tax on time. Most people with a debt like yours have paid it by now.	8,643	£23,563,039	£2,726.26	50.52	70.99
Minority status	You are currently in the very small minority of people who have not paid us yet.	8,587	£22,858,435	£2,661.98	50.38	70.68
Minority descriptive norm	Nine out of ten people in the UK pay their tax on time. You are currently in the very small minority of people who have not paid us yet.	8,731	£24,730,886	£2,832.54	50.44	71.72
Moral duty	Everyone in the UK should pay their tax on time.	8,507	£23,360,855	£2,746.07	50.61	71.22
General injunctive norm	The great majority of people agree that everyone in the UK should pay their tax on time.	8,595	£24,032,463	£2,796.10	50.40	71.46
Number injunctive norm	Nine out of ten people agree that everyone in the UK should pay their tax on time.	8,490	£22,526,004	£2,653.24	50.53	70.39
Percentage injunctive norm	88% of people agree that everyone in the UK should pay their tax on time.	8,428	£23,443,901	£2,781.67	50.47	71.18
Injunctive and descriptive norm	Nine out of ten people agree that everyone in the UK should pay their tax on time. And nine out of ten people do pay on time.	8,524	£24,175,451	£2,836.16	50.42	71.00
Additional information	You can pay by debit card, credit card, or Direct Debit. You can also pay using internet and telephone banking. For more information on how to pay, go to www.hmrc.gov.uk/payinghmrc. If you don't believe that this payment is overdue, please contact us on the number above.	8,499	£23,996,925	£2,823.50	50.27	71.16
Interest	We are charging you interest on this amount.	8,483	£23,918,198	£2,819.54	50.25	70.86

Source: Hallsworth, Michael & List, John A. & Metcalfe, Robert D. & Vlaev, Ivo, 2017. "The behavioralist as tax collector: Using natural field experiments to enhance tax compliance," Journal of Public Economics, Elsevier, vol. 148(C), pages 14-31

Tax Compliance

The Behavioralist as Tax Collector

General descriptive norm	0.014*	0.015*	-0.538
	0.008	0.008	0.604
Local descriptive norm	0.022***	0.023***	-1.136*
	0.008	0.008	0.600
Debt descriptive norm	0.030***	0.036***	-0.780
	0.008	0.008	0.596
Local and debt descriptive norm	0.050***	0.054***	-2.774***
	0.008	0.008	0.595
Minority status	0.047***	0.052***	-2.808***
	0.008	0.008	0.596
Minority descriptive norm	0.042***	0.045***	-2.185***
	0.008	0.008	0.592
Moral duty	0.022***	0.022***	-1.823***
	0.008	0.008	0.595
General injunctive norm	0.006	0.005	-0.431
	0.008	0.008	0.595
Number injunctive norm	0.017**	0.016**	-1.513**
	0.008	0.008	0.596
Percentage injunctive norm	0.034***	0.029***	-1.997***
	0.008	0.008	0.595
Injunctive and descriptive norm	0.036***	0.036***	-1.540***
	0.008	0.008	0.599
Additional information	0.032***	0.035***	-1.882***
	0.008	0.008	0.598
Interest	0.039***	0.040***	-1.359**
	0.008	0.008	0.600
Age		0.004***	-0.257***
		0.000	0.009
Male		-0.030***	2.384***
		0.003	0.252
Initial debt		0.00001***	0.0002***
		0.000	0.000
Accountant		0.027***	-2.444***
		0.004	0.309
Experienced		-0.219***	20.829***
		0.003	0.224
Pseudo R2	0.00	0.00	0.08
N	119,522	116,148	116,156

Source: Hallsworth, Michael & List, John A. & Metcalfe, Robert D. & Vlaev, Ivo, 2017. "The behavioralist as tax collector: Using natural field experiments to enhance tax compliance," Journal of Public Economics, Elsevier, vol. 148(C), pages 14-31

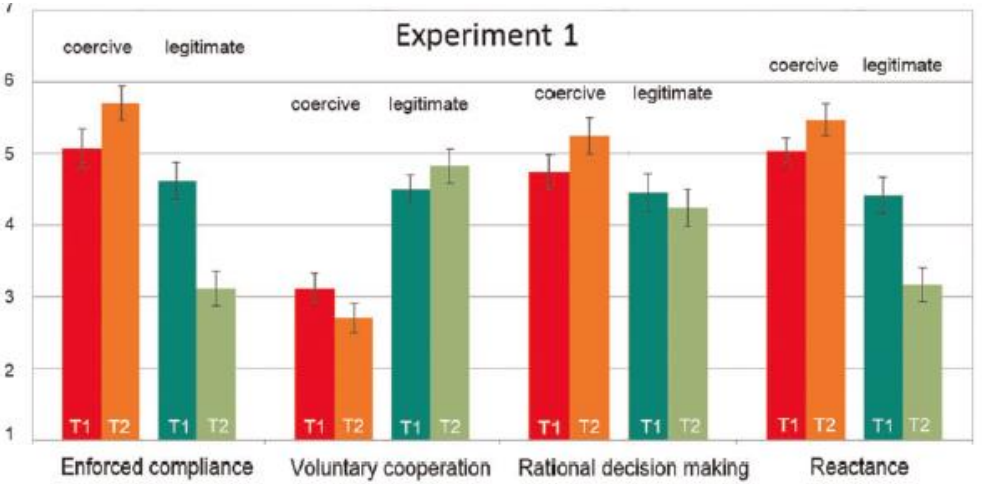
Tax Compliance

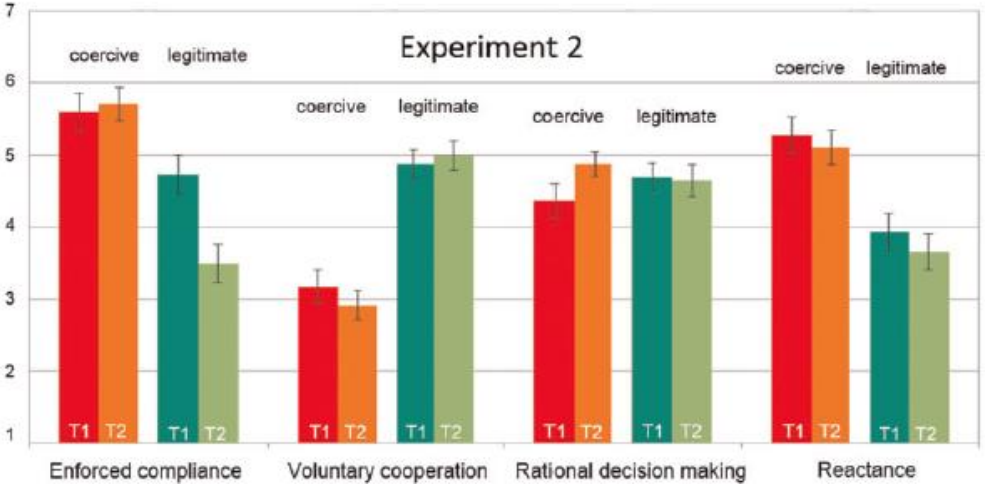
LEGITIMATE

or

COERCIVE

Cognitive Experiment



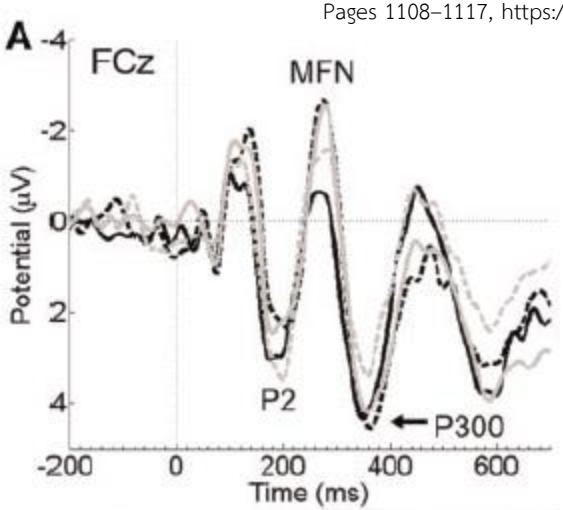


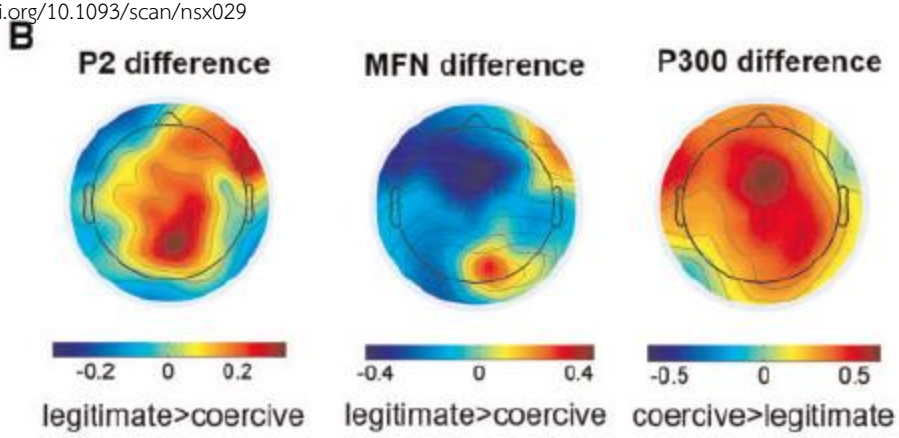
Source:Katharina Gangl, Daniela M. Pfabigan, Claus Lamm, Erich Kirchler, Eva Hofmann; Coercive and legitimate authority impact tax honesty: evidence from behavioral and ERP experiments, Social Cognitive and Affective Neuroscience, Volume 12, Issue 7, 1 July 2017, Pages 1108–1117, https://doi.org/10.1093/scan/nsx029

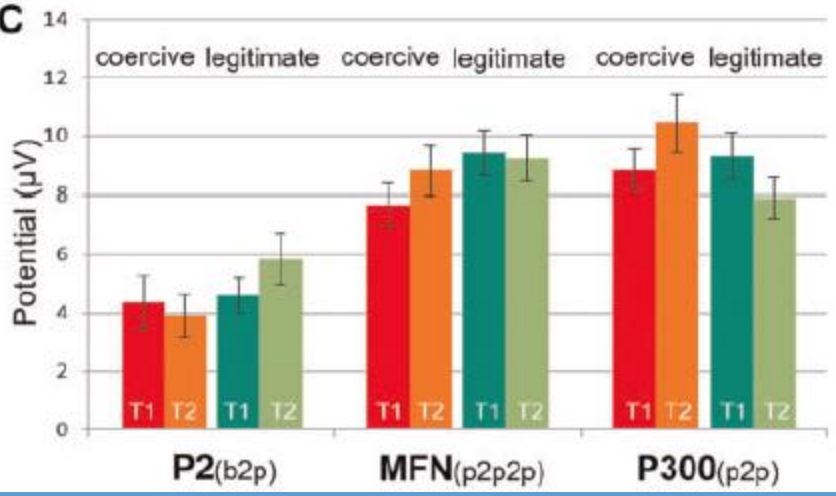
Tax Compliance

Cognitive Experiment

Source: Katharina Gangl, Daniela M. Pfabigan, Claus Lamm, Erich Kirchler, Eva Hofmann; Coercive and legitimate authority impact tax honesty: evidence from behavioral and ERP experiments, Social Cognitive and Affective Neuroscience, Volume 12, Issue 7, 1 July 2017, Pages 1108–1117, https://doi.org/10.1093/scan/nsx029







Excise Tax

Time Discounting and Smoking Decisions

Table 2. Financial Tradeoffs: Choices of Payment Now Versus a Year from Now

Dependent variable: choice of payoff now = 1 versus payoff a year from now = 0.	Sample All	Current Smoker	Former Smoker	Never Smoker
Win $20 now v. $30 in year	0.163**	0.161**	0.178**	0.143**
	(0.018)	(0.028)	(0.031)	(0.036)
Lose $1,500 in year v. $1,000 now	-0.130**	-0.115**	-0.131**	-0.150**
	(0.022)	(0.036)	(0.037)	(0.042)
Lose $30 in year v. $20 now	-0.185**	-0.194**	-0.177**	-0.184**
	(0.023)	(0.038)	(0.038)	(0.043)
Current smoker	0.044			
	(0.037)			
Former smoker	0.016			
	(0.036)			
Age	0.002			
	(0.002)			
Constant	0.506**	0.657**	0.625**	0.623**
	(0.142)	(0.030)	(0.031)	(0.039)
R^2	0.077	0.076	0.079	0.070
N	2,582	973	1,005	604

Robust standard errors are in parentheses.
Omitted groups are winning $1,000 now v. $1,500 a year from now and never smokers.
*Significantly different from zero at 5% level.
** Significantly different from zero at 1% level.

Source: Khwaja, Ahmed & Silverman, Dan & Sloan, Frank, 2007. "Time preference, time discounting, and smoking decisions," Journal of Health Economics, Elsevier, vol. 26(5), pages 927-949, September.

Excise Tax

Time Discounting and Smoking Decisions

Table 3. Healthy Days Tradeoff: Number of Extra Healthy Days in the Future Equal to 20 Extra Healthy Days This Year

	Sample			
	All	Current Smoker	Former Smoker	Never Smoker
This year v. 5 years from now	-0.357**	-0.414**	-0.292**	-0.378**
	(0.044)	(0.082)	(0.065)	(0.085)
This year v. 10 years from now	-0.416**	-0.465**	-0.360**	-0.435**
	(0.047)	(0.086)	(0.072)	(0.091)
This year v. 20 years from now	-0.454**	-0.501**	-0.397**	-0.475**
	(0.049)	(0.089)	(0.074)	(0.095)
Current smoker	-0.007			
	(0.044)			
Former smoker	-0.026			
	(0.041)			
Age	0.004			
	(0.003)			
Constant	0.500**	0.535**	0.432**	0.515**
	(0.058)	(0.092)	(0.077)	(0.098)
R^2	0.104	0.113	0.089	0.117
N	1,547	524	593	430

Robust standard errors are in parentheses.
Omitted groups are this year v. 1 year from now and never smokers.
*Significantly different from zero at 5% level.
** Significantly different from zero at 1% level.

Source: Khwaja, Ahmed & Silverman, Dan & Sloan, Frank, 2007. "Time preference, time discounting, and smoking decisions," Journal of Health Economics, Elsevier, vol. 26(5), pages 927-949, September.

Excise Tax

Time Discounting and Smoking Decisions

Table 4. Extra Months Needed to Get a Colonoscopy

		Sample		
	All	Current Smoker	Former Smoker	Never Smoker
Get colonoscopy a year from now	-1.020*	-1.774*	-0.976	-0.217
	(0.507)	(0.847)	(0.835)	(0.969)
Get colonoscopy a year from now with one more year of life expectancy	-1.358*	-1.238	-1.747	-0.979
	(0.575)	(1.008)	(0.949)	(1.048)
Current smoker	0.778			
	(1.631)			
Former smoker	-0.559			
	(1.312)			
Constant	13.245**	14.232**	12.784**	12.870**
	(1.129)	(1.314)	(0.997)	(1.228)
R^2	0.005	0.003	0.006	0.001
N	905	299	348	258

Omitted groups: get colonoscopy now and never smoker.
Robust standard errors are in parentheses.
*Significantly different from zero at 5% level.
** Significantly different from zero at 1% level.

Source: Khwaja, Ahmed & Silverman, Dan & Sloan, Frank, 2007. "Time preference, time discounting, and smoking decisions," Journal of Health Economics, Elsevier, vol. 26(5), pages 927-949, September.

Excise Tax

Time Discounting and Smoking Decisions

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Source: Khwaja, Ahmed & Silverman, Dan & Sloan, Frank, 2007. "Time preference, time discounting, and smoking decisions," Journal of Health Economics, Elsevier, vol. 26(5), pages 927-949, September.

Excise Tax

Time Discounting and Smoking Decisions

Table 5. Discount Rates in First Year and Subsequent Years by Smoking Status

		Sample		
Dependent variable: first year discount rate	All	Current Smoker	Former Smoker	Never Smoker
Discount rate: subsequent years	-0.021	-0.077	-0.044	0.074
	(0.034)	(0.056)	(0.055)	(0.065)
Current smoker	0.085			
	(0.068)			
Former smoker	-0.002			
	(0.064)			
Constant	-0.039	0.073	-0.030	-0.083
	(0.051)	(0.052)	(0.045)	(0.059)
R^2	0.006	0.005	0.002	0.005
N	562	185	217	160

Robust standard errors are in parentheses.
*Significantly different from zero at 5% level.
** Significantly different from zero at 1% level.

Source: Khwaja, Ahmed & Silverman, Dan & Sloan, Frank, 2007. "Time preference, time discounting, and smoking decisions," Journal of Health Economics, Elsevier, vol. 26(5), pages 927-949, September.

Excise Tax

Behavioral Economics Perspective on Tobacco Taxation

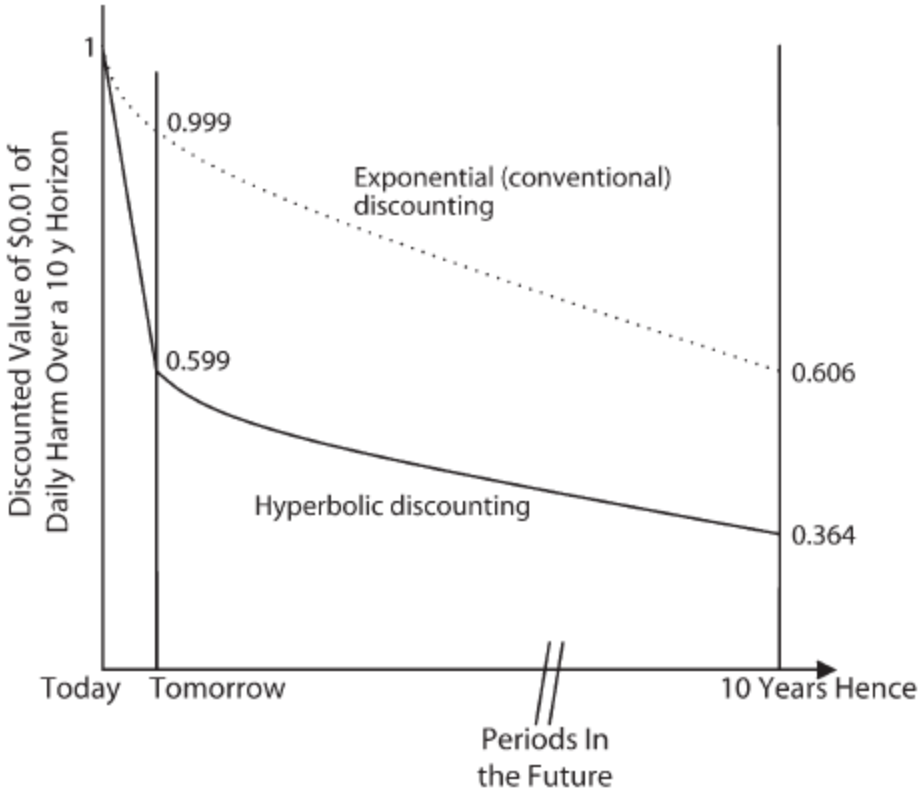
	Exponential Discounter	Hyperbolic Discounter A	Hyperbolic Discounter B
Smoker's valuation of benefit, $	25.00	25.00	25.00
Retail pack price paid by the smoker, $	5.00	5.00	5.00
Smoker's perception of health cost/day, $	0.01	0.01	0.01
Long-term discount factor, %	5.0	5.0	5.0
Short-term discount (multiplicative)	NA	0.9	0.6
Discounted value, today, of hypothetical health costs incurred at different points in the future,[a] cents			
Today (day 0)	1.0000	1.0000	1.0000
Tomorrow (day 1)	0.9999	0.8999	0.5999
In 1 wk (day 7)	0.9990	0.8991	0.5994
In 1 mo (day 30)	0.9959	0.8963	0.5975
In 1 y (day 365)	0.9512	0.8561	0.5707
In 5 y (day 1826)	0.7787	0.7008	0.4672
In 10 y (day 3652)	0.6064	0.5458	0.3638
Sum (discounted value of costs, day 0–3652), $	28.74	25.87	17.25
Total costs (retail pack price + discounted value of perceived health harm), $	33.74	30.87	22.25

Note. NA = not applicable. Discounting behavior refers to the extent to which costs and benefits further ahead in the future are undervalued from the perspective of the present. Exponential discounters do not make sudden jumps in their assessment of costs from 1 period to the next. A hyperbolic discounter's overemphasis on the current period underrates all future periods. A short-term discount factor of 0.6 implies a greater premium on immediate gratification than a short-term discount factor of 0.9, a lower assessment of the costs of smoking, and a correspondingly higher likelihood of smoking more cigarettes than intended at any point in the future. The exponential discounter and hyperbolic discounter A perceive the cost of a pack of cigarettes as exceeding the benefits of smoking it, thus will smoke fewer than 20 cigarettes. Hyperbolic discounter B perceives the cost as lower than its benefits and will smoke the whole pack or more.
[a]Hypothetical health costs = 1 cent/day.

Source: Cherukupalli R. A Behavioral Economics Perspective on Tobacco Taxation. American Journal of Public Health. 2010;100(4):609-615. doi:10.2105/AJPH.2009.160838.

Excise Tax

Behavioral Economics Perspective on Tobacco Taxation



Note. The area under the solid line represents net present value of perceived harm under hyperbolic discounting with a short-term discount factor of 0.6.

Source: Cherukupalli R. A Behavioral Economics Perspective on Tobacco Taxation. American Journal of Public Health. 2010;100(4):609-615. doi:10.2105/AJPH.2009.160838.

Excise Tax — *Behavioral Economics Perspective on Tobacco Taxation*

TABLE 3—Calibrating Optimal Internality Taxes on Cigarettes in the United States in the Presence of Hyperbolic Discounting

	Short-Term Discount Factor			
	1[a]	0.9	0.8	0.6
Discounted health damages,[b] $	35.64	35.64	35.64	35.64
Fraction of discounted health damages ignored by hyperbolic discounters	0	0.1	0.2	0.4
Implied optimal internality tax, $	0.00	3.56	7.13	14.26
Implied optimal tax (offsetting externality + internality), $	0.40	3.96	7.53	14.66

Note. Tobacco taxes should offset externalities that tobacco users' behavior imposes on society plus the internalities associated with difficulty in self-control. Taxes do not interfere with the component of use that reflects a personal preference, but do counter the considerable component of harm that arises from users overconsuming because they underestimate the magnitude of future costs of present actions.
Source. Adapted from Gruber and Köszegi, 2008.[6]
[a]Exponential discounting.
[b]Health costs reflect age-specific usage and the lower value placed on periods further into the future and were calculated in 6 steps: (1) assess the value of life, assuming that the main health damage from smoking is loss of life ($6.8 million); (2) assess the average loss of life for a smoker relative to the life expectancy of 79 years for nonsmokers (typically 6 years); (3) value the 6 extra years lost at the end of a smoker's life; (4) compute, for each year of life between 15 and 73, the discounted value of 6 years of life lost with a discount factor of 3% (i.e., the mortality cost at each age); (5) adjust mortality cost incurred by a smoker at each age by the fraction of cigarettes smoked at that age; (6) divide the costs of lifetime cigarette consumption by the average number of cigarettes smoked for a cost per pack of $35.64.

Source: Cherukupalli R. A Behavioral Economics Perspective on Tobacco Taxation. American Journal of Public Health. 2010;100(4):609-615. doi:10.2105/AJPH.2009.160838.

Excise Tax

Salience and Taxation

Source: Chetty, Raj, Adam Looney, and Kory Kroft. 2009. Salience and taxation: theory and evidence. American Economic Review 99(4): 1145–1177.

Excise Tax

Salience and Taxation

TREATMENT STORE

Period	Control Categories	Treated Categories	Difference
Baseline (2005:1-2006:6)	26.48 (0.22) [5510]	25.17 (0.37) [754]	-1.31 (0.43) [6264]
Experiment (2006: 8-2006:10)	27.32 (0.87) [285]	23.87 (1.02) [39]	-3.45 (0.64) [324]
Difference over time	0.84 (0.75) [5795]	-1.30 (0.92) [793]	**DD_{TS} = -2.14** (0.64) [6588]

CONTROL STORES

Period	Control Categories	Treated Categories	Difference
Baseline (2005:1-2006:6)	30.57 (0.24) [11020]	27.94 (0.30) [1508]	-2.63 (0.32) [12528]
Experiment (2006: 8-2006:10)	30.76 (0.72) [570]	28.19 (1.06) [78]	-2.57 (1.09) [648]
Difference over time	0.19 (0.64) [11590]	0.25 (0.92) [1586]	**DD_{CS} = 0.06** (0.90) [13176]
		DDD Estimate	***-2.20*** (0.58) [19764]

Source: Chetty, Raj, Adam Looney, and Kory Kroft. 2009. Salience and taxation: theory and evidence. American Economic Review 99(4): 1145–1177.

Excise Tax — *Salience and Taxation*

Effect of Posting Tax-Inclusive Prices: Regression Estimates

Dependent Variable:	Quantity per category	Quantity per category	Revenue per category ($)	Log quantity per category	Log revenue per category	Price paid per product ($)
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	**-2.20**	**-2.20**	**-13.12**	**-0.101**	**-0.123**	**-0.102**
	(0.58)***	(0.59)***	(4.88)***	(0.03)***	(0.04)***	(0.212)
Average Price		-3.15	-3.24			
		(0.26)***	(1.74)*			
Average Price Squared		0.05	0.06			
		(0.00)***	(0.03)**			
Log Average Price				-1.59	-0.39	
				(0.11)***	(0.11)***	
Category, Store, Week FEs		x	x	x	x	x
Sample size	19,764	19,764	19,764	18,827	18,827	18,827

Source: Chetty, Raj, Adam Looney, and Kory Kroft. 2009. Salience and taxation: theory and evidence. American Economic Review 99(4): 1145–1177.

Application

Sugary Drinks Taxation in Thailand

The National Reform Steering Assembly (NRSA)

APPROVED

NRSA's committee on health and environmental reform's proposal of levying excise tax on Sugar-Sweetened Beverages (SSBs)

Main Ideas of the Proposal:
- SSBs containing sugar above 6 grams per 100 ml should be taxed.
- Tax rate should be increase retail price at least 20 percent.
- Progressive Rate depends on level of caloric sugar contained.

Application

Sugary Drinks Taxation in Thailand

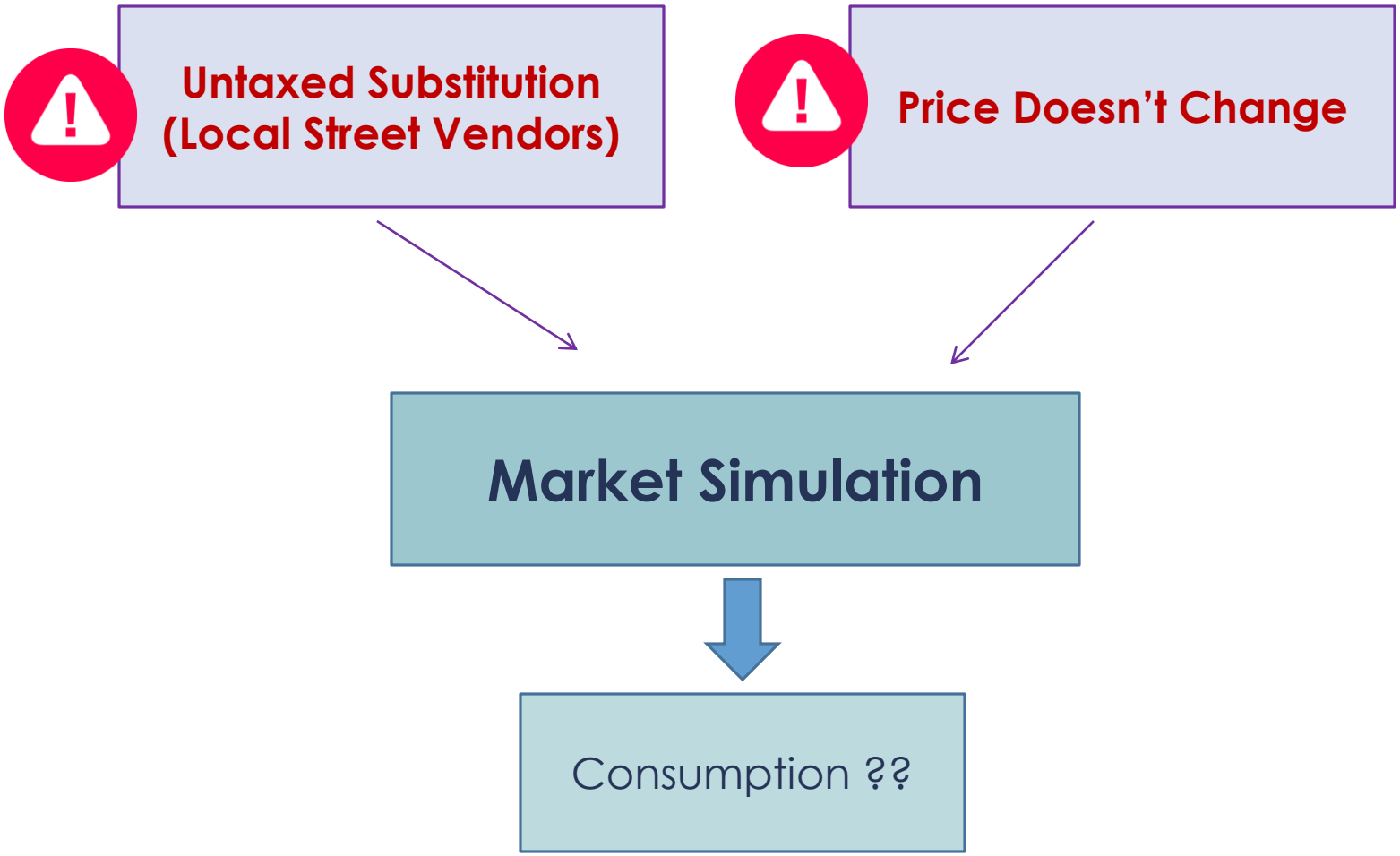
Excise Tax Pass-Through Mechanism → Price ↑ → Consumption ↓

Untaxed Substitution (Local Street Vendors)

Price Doesn't Change

Application

Sugary Drinks Taxation in Thailand



Application

Sugary Drinks Taxation in Thailand

Survey

(Jan 2017 – Feb 2017)

- **SSBs Perception**
- **Consumption Behavior**
- **Tax Policy Agreement**
- **Price Resistance**
- **Purchasing Behavior**

→ Paper

→ Online Survey (Survey Monkey)

Discrete Choice Experiment

(May 2017 – June 2017)

Purchasing Behavior and Influence of Relevant Attributes

→ conjoint.ly

Application — Sugary Drinks Taxation in Thailand

เรื่อง การสำรวจพฤติกรรมการดื่มและซื้อเครื่องดื่มของคนไทย

พฤติกรรมการดื่มเครื่องดื่มโดยทั่วไป

* 2. สินค้าเหล่านี้สามารถจัดประเภทเป็นสินค้าเครื่องดื่มได้ทั้งสิ้น ท่านทราบหรือไม่ (ทราบ)

น้ำอัดลม	นมโคกล่อง/ขวด	นมเปรี้ยว	นมถั่
เครื่องดื่มธัญญาหาร	โยเกิร์ตพร้อมดื่ม	เครื่องดื่มชูกำลัง	เครื่
น้ำผลไม้	น้ำพืชผัก	ชา/กาแฟพร้อมดื่ม*	ชา/ก
ชา/กาแฟผง(สำหรับชง)	บิวตี้ดริ้ง (Beauty Drink)	ฟังก์ชั่นนอลดริ้ง	

*พร้อมดื่มคือเครื่องดื่มที่บรรจุกล่อง/กระป๋อง/ขวดปิดพร้อมดื่มแล้ว

- ○ ทราบ
- ○ ไม่ทราบ

14.1 ถ้าเครื่องดื่มที่ท่านชอบ**ขนาด 500 ml** (ขนาดขวดฝากลมพลาสติกมาตรฐานทั่วไป) **ราคาปัจจุบันอยู่ที่ 15** ในอนาคตหากราคาขายเปลี่ยนไป ท่านจะซื้อเครื่องดื่มชนิดใด (ตอบเพียงข้อเดียว)

		
เครื่องดื่มพร้อมดื่มที่ท่านชอบ ขนาด: **500 ml** ราคา: **18 บาท**	เครื่องดื่มพร้อมดื่มที่ท่านชอบ ขนาด: **445 ml** ราคา: **15 บาท**	เครื่องดื่มพร้อมดื่มที่พอแทนกันได้ ขนาด: **500 ml** ราคา: **15 บาท**
1	**2**	**3**

	Street Vendor	Ready-to-Drink	Ready-to-Drink	Street Vendor
Product				
Price	20 บาท	18 บาท	15 บาท	30 บาท
Size	350 ml 	550 ml 	325 ml 	590 ml 
Sugar Level	Normal	Less Sugar	Normal	Normal
Taste Familiarity	Favorite drink/Usual Vendor	Favorite drink/Usual Vendor	Substi-tutes/New Street Vendor	Substi-tutes/New Street Vendor
Attribute				

Application

Sugary Drinks Taxation in Thailand

Survey

	Total	N=507	100%
Survey Design	online	287	56.61%
	paper	220	43.39%
Age	15-20	75	14.79%
	21-25	293	57.79%
	26-30	65	12.82%
	Above 30	74	14.60%
Gender	Male	209	41.22%
	Female	298	58.78%
Income	below 10,000 baht	198	39.05%
	10,001-30,000	214	42.21%
	above 30,001	95	18.74%

Discrete Choice Experiment

	Total	N=320	100%
Age	15-20	14	4.38%
	21-25	144	45.00%
	26-30	106	33.13%
	Above 30	56	17.50%
Gender	Male	125	39.06%
	Female	195	60.94%
Income	below 10,000 baht	39	12.19%
	10,001-30,000	143	44.69%
	above 30,001	138	43.13%

Application

Sugary Drinks Taxation in Thailand: PERCEPTION

Categories	Word listed
Feeling	Refreshing, Enjoyment, Tiresome, Excitement, Creative
Taste	Sweet, Sugar, Delicious, Spicy,Fizziness, Juicy
Health-Related	Stomachache, Obesity, Healthy, Energizing
Socialization	Playing Sports, Friends, Party, Conversation
Product Appearance	Hot, Cold, Bottle, Can, Glass, Black

Application

Sugary Drinks Taxation in Thailand: PERCEPTION

Favorite SSBs

- Carbonated Soft Drinks
- Fresh Milk and Flavored Milk
- Fruit Juice and Veggie
- Drinking yogurt

Frequency

55% : 2 – 4 times a week
22 %: At least 1 time per day

Price

67% : 15 – 25 Baht

Application

Sugary Drinks Taxation in Thailand: SUBSTITUTION

Carbonated Soft Drinks

1. Drinking Water
2. Juice and Veggie
3. Drinking Yogurt

Flavored Milk

1. Fresh Milk
2. Drinking Water
3. Soy Milk

Energy Drink

1. Drinking Water
2. Sport Drink
3. Carbonated Soft Drinks

Sport Drink

1. Drinking Water
2. Juice and Veggie
3. Carbonated Soft Drinks

Application

Sugary Drinks Taxation in Thailand: SUBSTITUTION

Fruit juice and Veggie

1. Drinking Water
2. Drinking Yogurt
3. Fresh Milk or flavored Milk

RTD Tea

1. Drinking Water
2. Street Vendors' Beverages
3. Juice and Veggie

RTD Coffee

1. Street Vendors' Beverages
2. Drinking Water
3. Drinking Yogurt

Application

Sugary Drinks Taxation in Thailand: SIMULATION

Consumption Reasons

RTD Beverages

1. Tastiness
2. Convenience
3. Thirst-Quenching
4. Refreshing
5. Price

Local Street Vendors

1. Tastiness
2. Convenience
3. Price
4. Thirst-Quenching
5. Refreshing

Relevant Factors

Type of Drink + Price + Taste + Convenience

Market Simulation & Response

Respondents' Decision Under 1st Scenario (Only RTD, Cost Reduction Strategy)

Total Samples = 490 (100%)		
Stop Buying = 11 (2.24%)		
 **Drink:** Favorite **Size:** 330 ml **Price:** 18 Baht	 **Drink:** Favorite **Size:** 250 ml **Price:** 15 Baht	 **Drink:** Favorite (with Slight Change of taste) **Size:** 330 ml **Price:** 15 Baht
N = 157 (32.04%)	N =204 (41.63%)	N = 118 (24.08%)

Respondents' Decision Under 2nd Scenario (RTD&Street Vendors, Price Low)

Total Samples = 491 (100%)		
Stop Buying = 40 (8.15%)		
 **Drink:** Favorite RTD **Size:** 185 ml **Price:** 16 Baht	 **Drink:** Favorite Locally Produced Beverage **Size:** 185 ml **Price:** 15 Baht	 **Drink:** Favorite Locally Produced Beverage **Size:** 350 ml **Price:** 20 Baht
N = 158 (32.18%)	N = 154 (31.36%)	N = 139 (28.31%)

Market Simulation & Response

Respondents' Decision Under 3rd Scenario (RTD & Street Vendors, Price Hike)

Total Samples = 490 (100%)		
Stop Buying = 64 (13.06%)		
 **Drink:** Favorite RTD **Size:** 185 ml **Price:** 20 Baht	 **Drink:** Familiar Locally Produced Beverage **Size:** 185 ml **Price:** 30 Baht	 **Drink:** Unfamiliar Locally Produced Beverage **Size:** 350 ml **Price:** 20 Baht
N = 168 (34.29%)	N = 126 (25.71%)	N = 132 (26.94%)

Respondents' Decision Under 4th Scenario (Only RTD, Sugar Level Varied)

Total Samples = 478 (100%)			
Stop Buying = 33 (6.90%)			
 **Drink:** Favorite **Sugar:** 12% **Price:** 18 Baht	 **Drink:** Favorite **Sugar:** 11% **Price:** 17 Baht	 **Drink:** Favorite **Sugar:** 10% **Price:** 16 Baht	 **Drink:** Favorite **Sugar:** 8% **Price:** 15 Baht
N = 64 (13.39%)	N = 34 (7.11%)	N = 56 (11.72%)	N = 291 (60.88%)

Real Market Simulation

1st Scenario + 2nd Scenario + 3rd Scenario + 4th Scenario

Beverages' Attributes	Attributes' Level
Product Type	Ready-to-Drink
	Street Vendors' Drinks
Price	15 Baht
	16 Baht
	17 Baht
	18 Baht
	20 Baht
	25 Baht
	30 Baht
Size	325
	350
	470
	500
	550
	590
Sugar Level	Low Sugar/ Low Calorie
	Normal Sweet Level
Taste or Familiarity	Favorite drink/Usual Vendor
	Substitutes/New Street Vendor
Proximity	3 Steps or Less than 10 meters ahead
	100 meters ahead

Choice Experiments

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	
Product	Ready-to-Drink 	Street Vendor 	Ready-to-Drink 	Street Vendor 	
Price	15 Baht	25 Baht	17 Baht	15 Baht	
Size	325 ml 	590 ml 	500 ml 	470 ml 	None is preferred
Sugar Level	Less Sugar	Normal	Normal	Normal	
Taste Familiarity	Substi-tutes/New Street Vendor	Favorite drink/Usual Vendor	Favorite drink/Usual Vendor	Substi-tutes/New Street Vendor	
Proximity	3 step ahead	100 meters ahead	100 meters ahead	3 step ahead	

Statistical Inferences from Choice Experiment

Fixed Effect Logistic Regression of Purchasing Decision (1 = Buy, 0 = Not Buy)

Fixed Effects:				
Variables of Interest	Estimate	Std. Error	z-value	Pr(>|z|)
Intercept	2.009	0.759	2.645	0.008***
Local Street Drink (LSD) (0 = RTD, 1 =LSD)	- **1.994**	0.812	-2.454	0.014**
Price (Baht)	- 0.213	0.045	-4.721	0.000***
Size of Product (10 ml)	0.0123	0.005	2.257	0.024**
Regular Sugar Level (Less Sugar = 0, Regular Sugar = 1)	- 0.809	0.121	-6.714	0.000***
Unfamiliarity (Favorite Drink = 0 Substitutes = 1)	- 0.484	0.113	-4.263	0.000***
Long Distance (3 Steps = 0 100 Meters ahead = 1)	- **1.134**	0.118	-9.583	0.000***
LSD*Price	0.198	0.046	4.314	0.000***
LSD*Size	0.0005	0.007	0.071	0.944
LSD*Unfamiliarity	- 0.354	0.156	-2.276	0.023**
LSD*Long Distance	0.150	0.150	1.000	0.317

Application

Sugary Drinks Taxation in Thailand: PRIMARY CONCLUSION

- Thai consumers frequently drink highly sugar-sweetened beverages due to its taste, its refreshing and easy-to-find characteristics

- Consumers believe that taxation might be able to curb consumption behavior and cause them to buy drinking water instead

- There is a possibility of consumption shift from taxed SSBs to untaxed SSBs, even though SSBs are preferable

- Accessibility to SSBs, caloric sugar concentration, and product familiarity are important factors influencing purchasing decision

Suggestion: Specific tax with rate varied by level of sugar concentration

+

Non-Tax Measures

Supporting healthier beverages and restrict high calorie beverages

Q&A

Q & A