Eliminating the Underground Economy: Evidence from Lottery Gambling Policy in Thailand

Presented by Suparit Suwanik

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Today's Roadmap

- Motivations
- Research Questions
- Related literature
- Setup: Data and Empirical Strategies
- Results
- Discussion and Policy Recommendation

The following presentation is based on Hongdilokkul N., Paweenawat A., Samphantarak K., and Suwanik S. (2022). *Eliminating the Underground Economy: Evidence from Lottery Gambling Policy in Thailand*. Unpublished manuscript.

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Executive Summary

- This paper examines the effects and implications of a supply-side intervention in the Thai lottery market from June 2003 to November 2006, **with a particular emphasis on household behavior changes**
  - The supply-side intervention, particularly the crackdown, was **effective** in eliminating the black-market lotteries
  - However, the substitution from black-market lotteries to government lotteries was **statistically significant but small**, whereas the substitution from government lotteries to black-market lotteries **was statistically significant and large**
  - The 2003 supply-side intervention of lottery business had **a long-term impact** on changing households' gambling behavior, i.e., the households significantly decrease expenditures on the black-market lotteries, government lotteries and other types of gamblings
- This paper also investigates **the characteristics of various types of households**
  - The older and more educated tend to correlate with no-gambling behavior
  - Male household heads and higher levels of debt are associated with constant-gambling-involvement households

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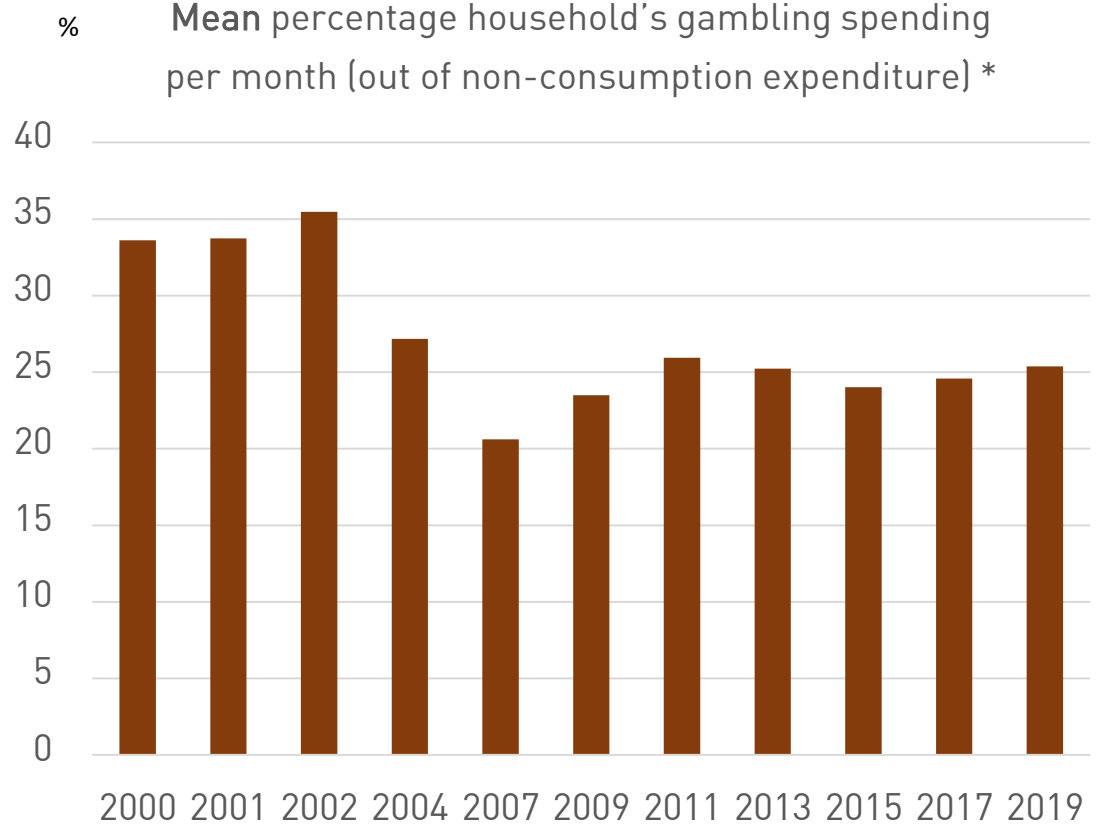
Motivation#1
Thai households are substantially engaged in gambling…

Extensive margin

Intensive margin



*Out of household who has gambling spending; subject to availability of the survey; as a percentage of monthly total household expenditures, it is approximately 1- 2% which is in line with Miller & Paulson (2007)
Source: Socio-Economic Survey (SES), National Statistical Office

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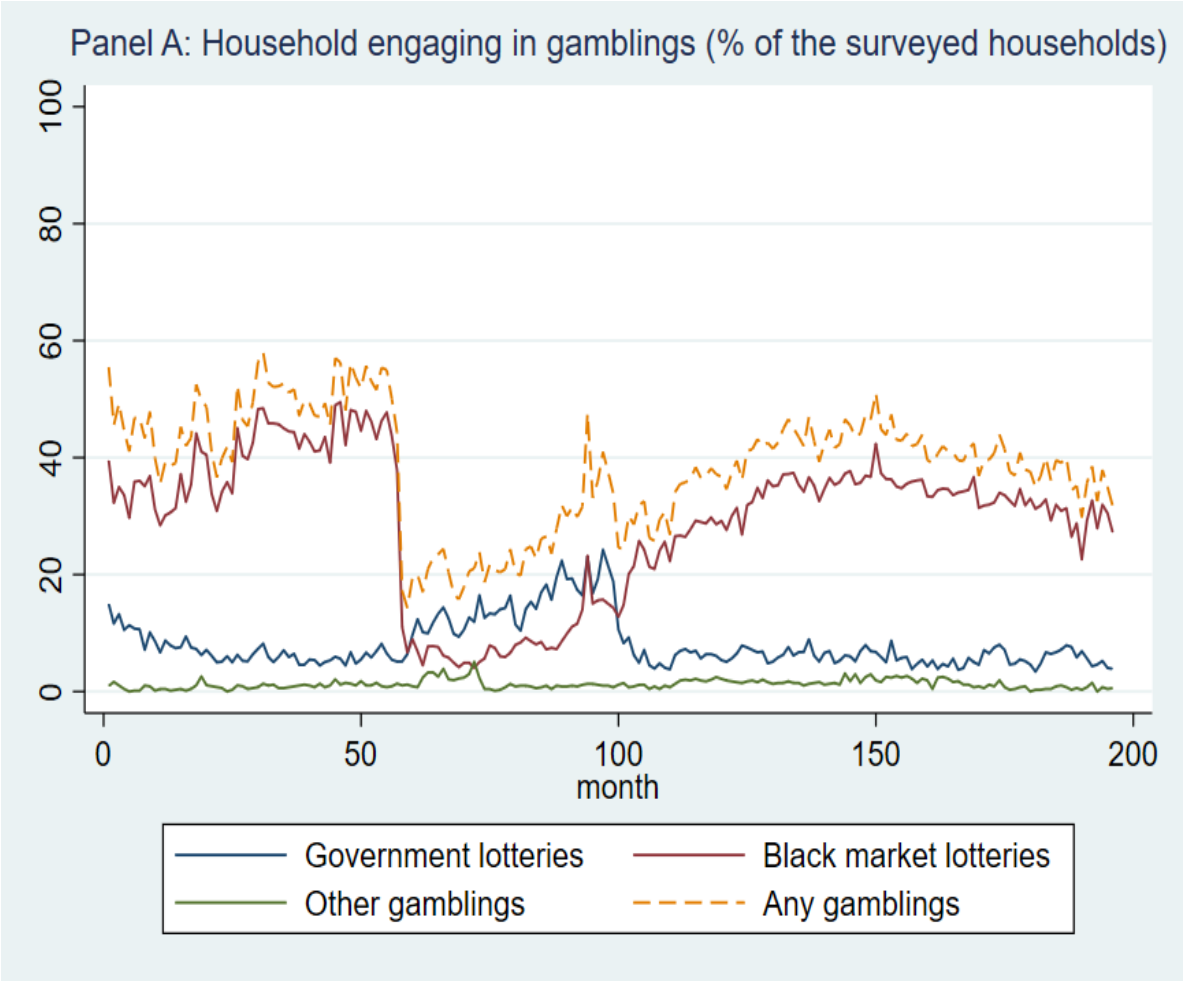
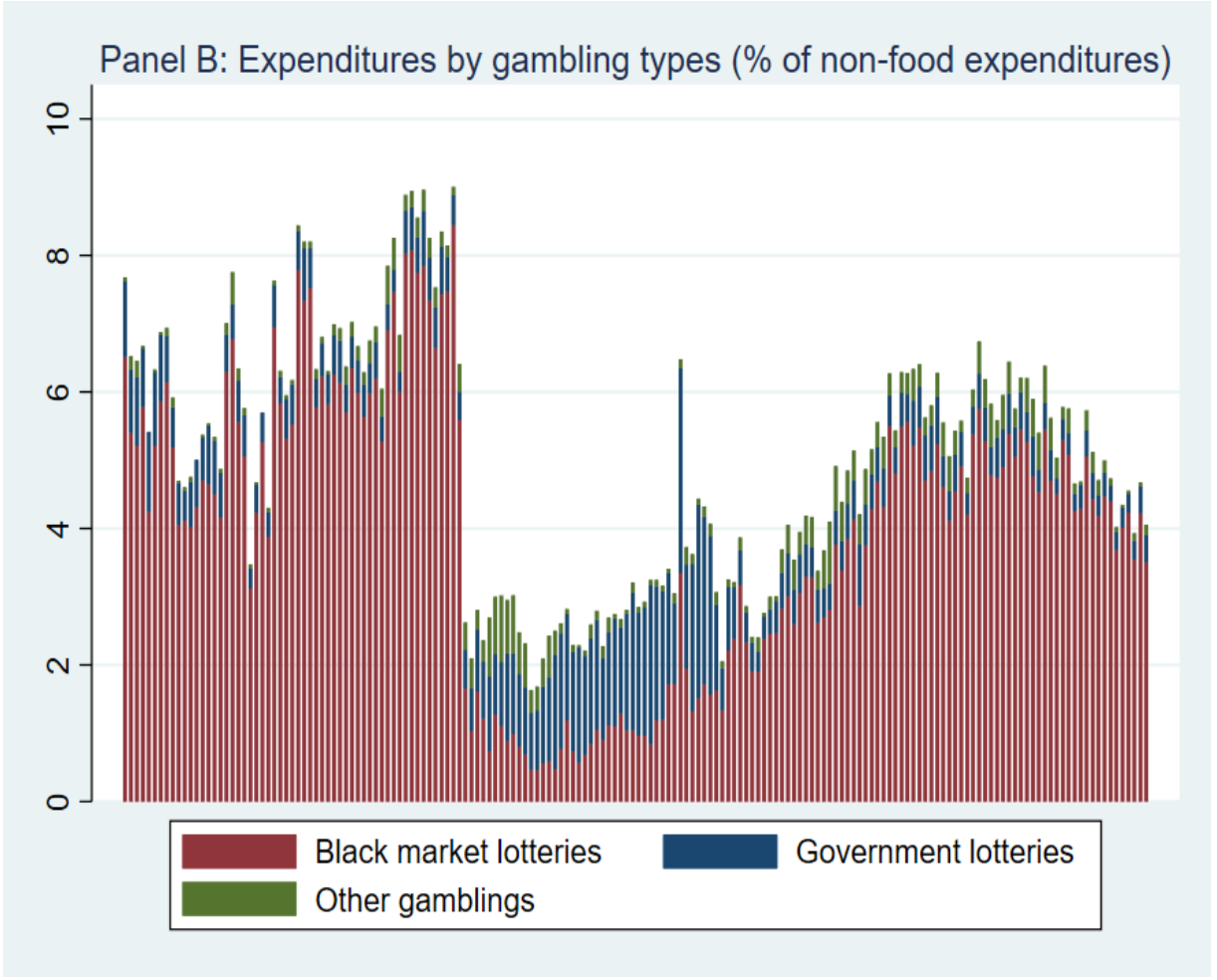
...particularly in lotteries





Source: Townsend Thai Monthly Resurveys (Month 1 – 196)
*Sep 1998 – Dec 2014

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Motivation#2
The Thai Government exerted severe pressure on black-market lottery (BML)

ยุติธรรมประกาศล้างบางมาเฟีย

Facebook Twitter Line

ข่าวทั่วไป Wednesday May 21, 2003 15:31 –ThaiPR.net

รมว.ยุติธรรม กล่าวว่า จากการประชุมดังกล่าวทำให้เกิดกรอบแนวทางการดำเนินงานปราบปรามผู้มีอิทธิพลที่ชัดเจนมากขึ้นและกำลังอยู่ระหว่างขั้นตอนการปฏิบัติ ซึ่งเป็นหน้าที่ของศูนย์อำนวยการต่อสู้เพื่อเอาชนะยาเสพติดแห่งชาติดำเนินการปราบปรามผู้มีอิทธิพล ทั้ง 15 กลุ่ม คือ (1) ยาเสพติด (2) ฮั้วการประมูล (3) การเรียกรับผลประโยชน์จากโรงงานและสถานบริการ (4) คิวมอเตอร์ไซค์ รถรับจ้างที่ผิดกฎหมาย (5) ลักลอบขนสินค้าหนีภาษี น้ำมันเถื่อน (6) บ่อนการพนัน หวยใต้ดิน (7) ลักลอบค้าหญิงและเด็ก (8) หลอกลวงคนไปทำงานต่างประเทศ (9) ลักลอบนำคนเข้า- ออก นอกประเทศ (10) หลอกลวงต้มตุ๋นนักท่องเที่ยว (11) มือปืนรับจ้าง (12) ทวงหนี้ข่มขู่ (13) ค้าอาวุธ (14) บุกรุกที่ดินสาธารณะ (15) เรียกค่าคุ้มครองในที่สาธารณะ เส้นทางหลวงหรือเก็บส่วย "กลุ่มผู้มีอิทธิพลทั้ง 15 กลุ่มนี้ ถือเป็นส่วนหนึ่งของผู้มีอิทธิพลแต่ในทางปฏิบัติได้ให้เจ้าหน้าที่ใช้ดุลยพินิจว่าอาจจะมีกลุ่มอื่น ๆ ที่ใช้อำนาจในมือกลั่นแกล้งประชาชนนั้นเข้าข่ายกลุ่มผู้มีอิทธิพลหรือไม่ โดยกระทรวงยุติธรรมจะประสานงานเจ้าหน้าที่ของรัฐที่มีพฤติกรรมสนับสนุน ช่วยเหลือ เป็นตัวการ อยู่เบื้องหลัง ผู้มีอิทธิพลทั้งหลายให้หยุดพฤติกรรมเหล่านั้นตั้งแต่วันนี้เป็นต้นไปเพราะมิฉะนั้นจะต้องถูกดำเนินการขั้นเด็ดขาดด้วยกฎหมายที่มีอยู่ ทั้งกฎหมายอาญา กฎหมายฟอกเงิน กฎหมายภาษี ตามกระบวนการยุติธรรม" รมว.ยุติธรรม กล่าว

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Motivation#3
The government also adopted the two- and three-digit lottery (TTL) schemes

Changes in regulations on lotteries in Thailand

Jun 2003
Serious crackdown on BML

Dec 2006
Discontinuation of both serious crackdown and TTL

Time

Aug 2003
Beginning of TTL

The six-digit government lottery

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Research questions

1. What were the effects and implications of a supply-side intervention in the Thai lottery market between June 2003 and November 2006, **with a focus on household behavior changes**?
   - Substitution effects
   - Persistent effect in the long run
2. What were **the unique characteristics** of various types of households, e.g., constant-gambling-involvement households and non-gambling households?

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Related literature

- **Two different strands of literature**
  - Demand side
    - Lottery Purchasing Behavior, particularly why people play lotteries
    - Potential addictiveness of lottery gambling
    - Winner's life after winning lotteries
    - Demand-side intervention, e.g., information/awareness campaigns
  - Supply side
    - Supply-side intervention, e.g., supply reduction, risk reduction, harm reduction, legalization of gambling
- **Our paper joins a growing number of literature, providing**
  - New empirical evidence on the combination of illegal gambling supply reduction and legalization strategies
  - Implications on long-run effect of changing households' behavior

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Data

- **Townsend Thai Project Household Monthly Surveys**
  - From September 1998 to December 2014 covering the time period before, during, and after the TTL was active
  - Surveyed households were randomly selected from the rural areas of four provinces: Chachoengsao; Lopburi; Buriram; Srisaket **in total of 710 households**
  - A province consists of several districts. Each of the district is a collection of villages with at least one urbanized area at its center
  - These four provinces are different in terms of economic conditions, but villages within the same district are similar
  - Data regarding household expenditures, income, assets, liabilities, and cash are from the Monthly Survey of Household Financial Accounting

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Empirical Strategies

- **Difference-in-Differences Models**
  - To study the effect of two major policy changes regarding lotteries, i.e.,
    1. The serious crackdown of BML dealers alongside the launch of the government-operated TTL in 2003; and
    2. The discontinuation of TTL in 2006
  - The study interval for each policy change spanned over 36 months before and after the month of the policy change
- **Probit Model**
  - To investigate the characteristics of various types of households, e.g., constant-gambling-involvement and non-gambling households

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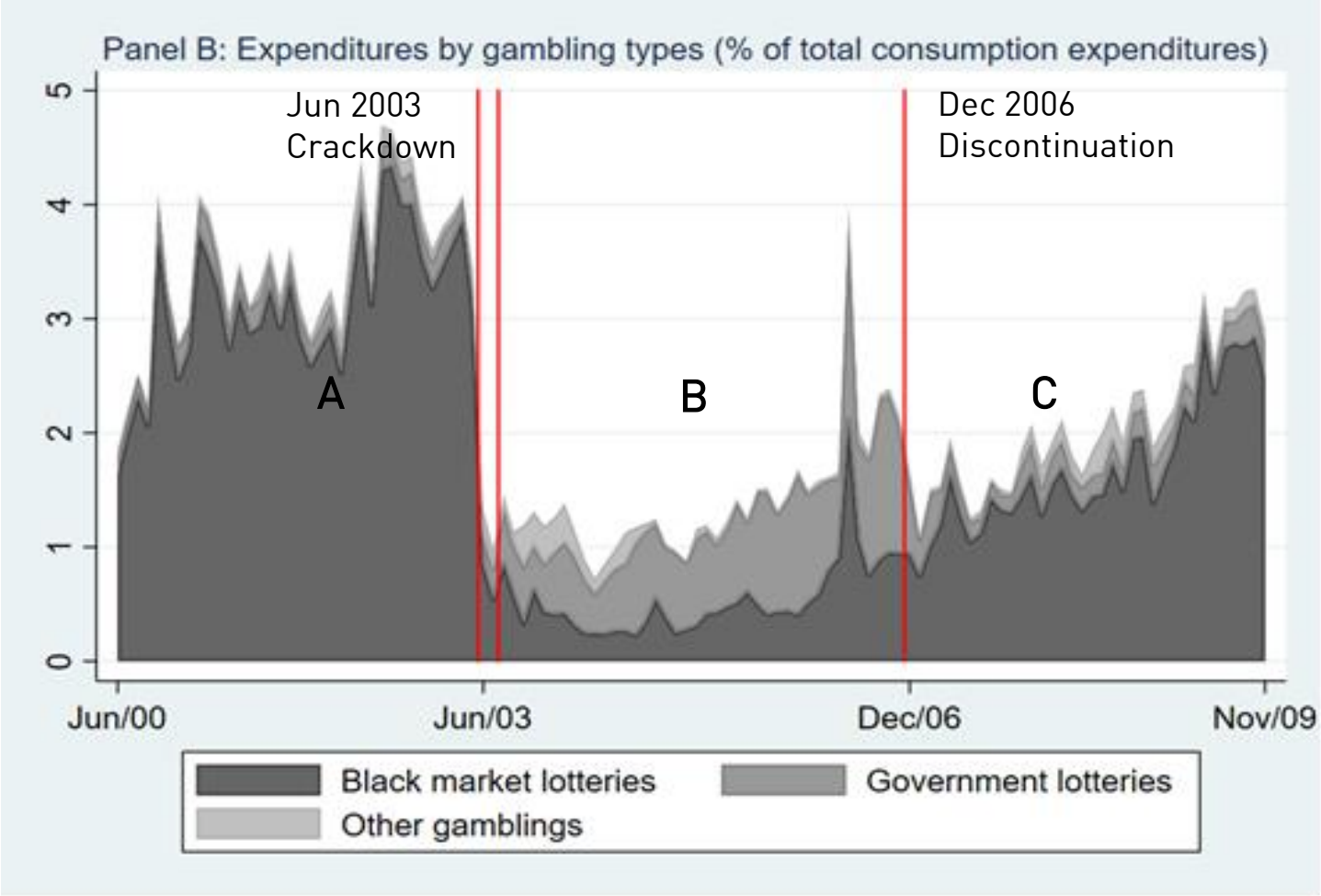
Results: Outcome Trend



Source: Townsend Household Financial Accounting (1-172) merged with Monthly Resurveys
*Sep 1998 – Dec 2014

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Difference-in-Differences Models

1. Estimate the effect of the 2003 crackdown

using data between Jun 2000 and May 2006 (36 months before and after the policy change)

$$Y_{im} = \alpha_i + \gamma_m + \beta Post_m^{2003} * Treat_t^I + \mathrm{X_{im}}B + \in_{im}$$

- $\boldsymbol{Treat_t^I}$ **is expenditure on black market lotteries** (% of total consumption expenditures) **between Jun 2000 to May 2003**
- $\boldsymbol{Post_m^{2003}}$ is a binary for the month on or after Jun 2003

**Note:* Y_{im} is the outcome of household i in month m; α_i is a household fixed effect; γ_m is a month fixed effect; $\mathrm{X_{im}}$ is other covariates; $\in_m$ is an error term

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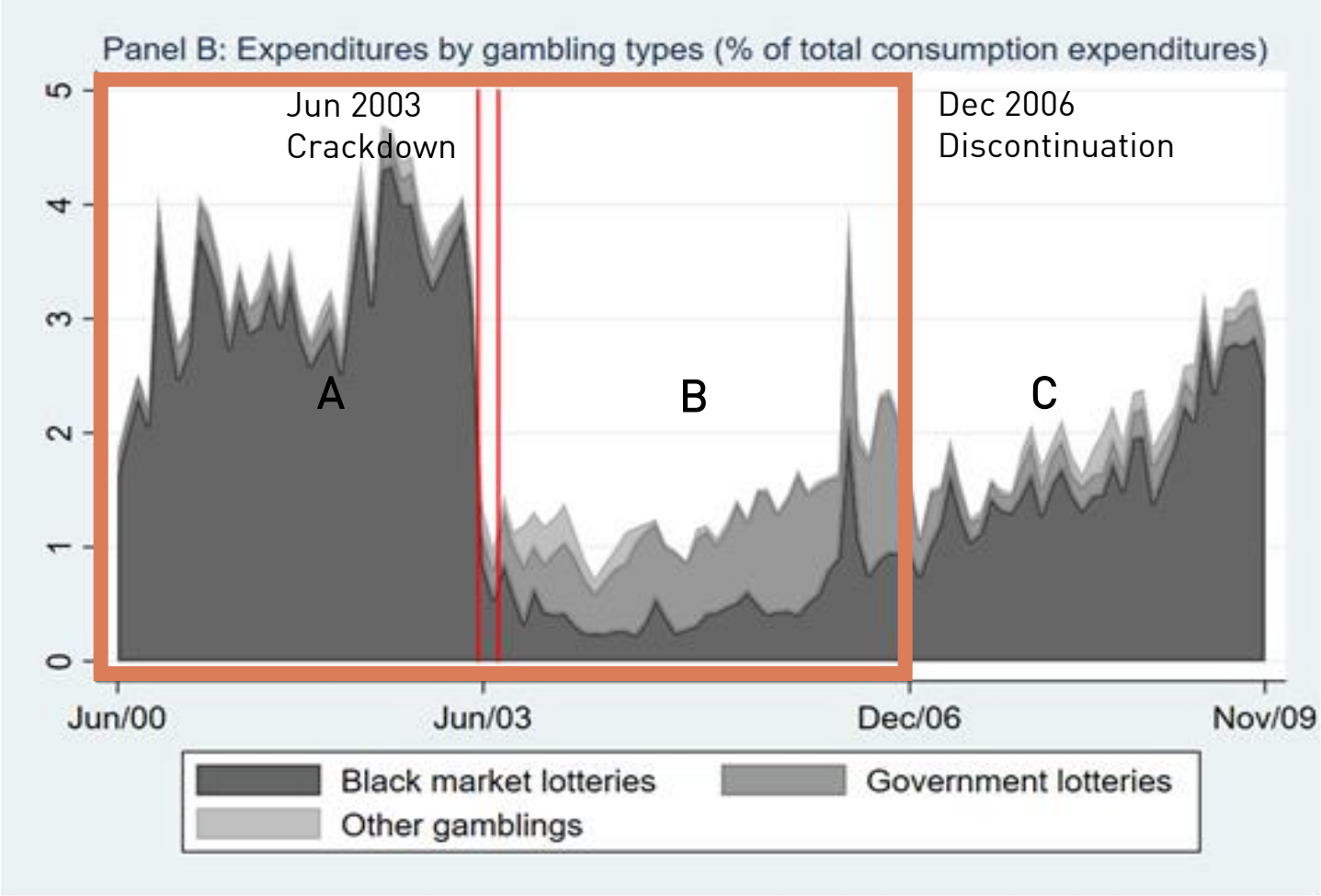

Source: Townsend Household Financial Accounting (1-172) merged with Monthly Resurveys
*Sep 1998 – Dec 2014

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Substitutability from black-market lottery to government lottery is small

Period A & B

	ESTIMATE	STANDARD ERROR	PARALLEL TREND ASSUMPTION
Expenditure			
On government lotteries	0.08***	0.01	√
On black market lotteries	-0.81***	0.02	Underestimated magnitude
On other types of gamblings	0.01***	0.00	√
On alcohol, tobacco, and eating out	0.00	0.01	√
Other food consumption expenditures	0.23***	0.02	☒
Other non-food consumption expenditures	0.49***	0.03	☒

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Period A & B

	ESTIMATE	STANDARD ERROR	PARALLEL TREND ASSUMPTION
Other expenditures			
On tickets for concerts, museums, games etc.	0.001	0.001	√
On sports fees and equipment	0.000	0.000	√
On cosmetics, soaps, shampoos, toothpaste etc.	0.020***	0.007	☒
On services e.g. haircut, manicure, massage etc.	0.008***	0.0015	√
On maintenance of house and private vehicles	0.94	0.66	√
On education	0.14***	0.01	☒
On training	0.002***	0.0006	√
On health	0.01	0.02	√

*The surveyed households consisted of 710 household engaging in at least one interview between June 2000 and Nov 2009. All of the outcomes were measured as percentages of household's total expenditure on consumption goods and services (including both food and non-food (e.g. gasoline, utilities, rent, clothes, transportation) items). The pre-crackdown period = June 2000 – May 2003. The post-crackdown period = June 2003 - May 2006. The effects were estimated with a fixed-effects model using the within regression estimator with household fixed effects, adjusting for month fixed effects. Standard errors were clustered at the household level. *** p←0.001, ** p←0.01, * p←0.05

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Difference-in-Differences Models

2. and 3. Estimate the effect of the 2006 discontinuation effect

using data between Dec 2003 and Nov 2009 (36 months before and after the policy change)

$$Y_{im} = \alpha_i + \gamma_m + \beta Post_m^{2006} * Treat_t^j + X_{im}B + \in_{im}$$

- $\boldsymbol{Treat_t^I}$ **is expenditure on black market lotteries** (% of total consumption expenditures) **between Jun 2000 to May 2003**
- $\boldsymbol{Treat_t^{II}}$ **is expenditure on government lotteries** (% of total consumption expenditures) **between Dec 2003 to Nov 2006**
- $\boldsymbol{Post_m^{2006}}$ is a binary for the month on or after Dec 2006

**Note:* Y_{im} is the outcome of household i in month m; α_i is a household fixed effect; γ_m is a month fixed effect; X_{im} is other covariates; $\in_m$ is an error term

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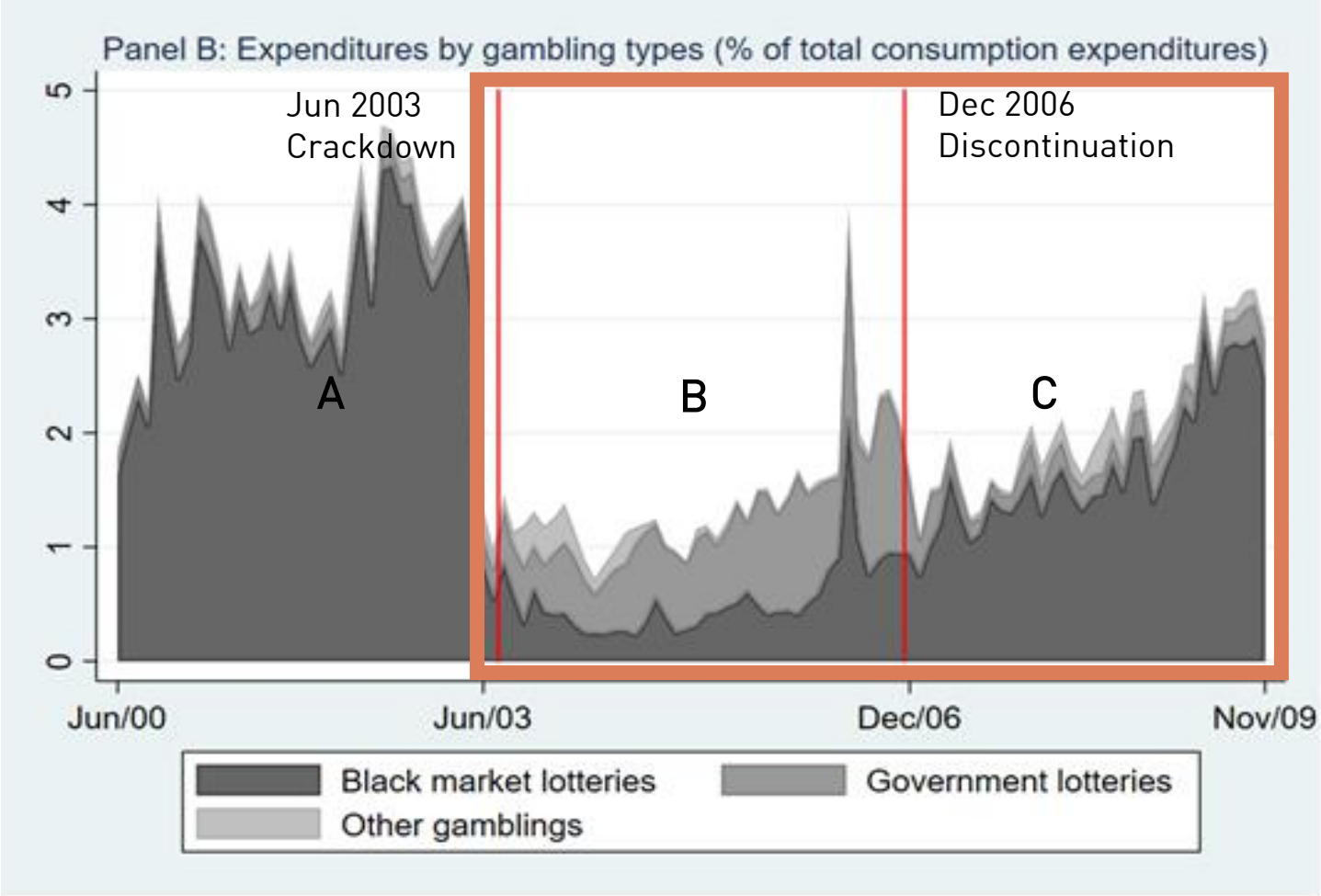

Source: Townsend Household Financial Accounting (1-172) merged with Monthly Resurveys
*Sep 1998 – Dec 2014

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Substitutability from government lottery to black-market lottery is large

Period B & C

$Treat_t^{II}$ **is expenditure on government lotteries** (% of total consumption expenditures) **between Dec 2003 to Nov 2006**

	ESTIMATE	STANDARD ERROR	PARALLEL TREND ASSUMPTION
Expenditure			
On government lotteries	-0.81***	0.04	√
On black market lotteries	0.56***	0.03	√
On other types of gamblings	-0.01	0.01	√
On alcohol, tobacco, and eating out	0.07**	0.04	☒
Other food consumption expenditures	0.06	0.07	√
Other non-food consumption expenditures	0.14*	0.08	√

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Period B & C

	ESTIMATE	STANDARD ERROR	PARALLEL TREND ASSUMPTION
Other expenditures			
On tickets for concerts, museums, games etc.	-0.0002	0.003	√
On sports fees and equipment	-0.002**	0.001	√
On cosmetics, soaps, shampoos, toothpaste etc.	0.08***	0.02	☒
On services e.g. haircut, manicure, massage etc.	-0.01**	0.005	√
On maintenance of house and private vehicles	0.15	0.60	√
On education	0.09**	0.04	☒
On training	0.002	0.004	√
On health	-0.07	0.09	√

*The surveyed households consisted of 710 household engaging in at least one interview between June 2000 and Nov 2009. All of the outcomes were measured as percentages of household's total expenditure on consumption goods and services (including both food and non-food (e.g. gasoline, utilities, rent, clothes, transportation) items). The pre-discontinuation period = Dec 2003 – Nov 2006. The post-discontinuation period = Dec 2006 - Nov 2009. The effects were estimated with a fixed-effects model using the within regression estimator with household fixed effects, adjusting for month fixed effects. Standard errors were clustered at the household level. *** p←0.001, ** p←0.01, * p←0.05

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Difference-in-Differences Models

4. Estimate the pure behavioral effect after the 2006 discontinuation

using data from two periods: (1) 36 months prior to the crackdown (June 2000 – May 2003) and (2) 36 months after the discontinuation (December 2006 – November 2009)

$$Y_{im} = \alpha_i + \gamma_m + \beta Post_m^{2006} * Treat_t^I + X_{im}B + \in_{im}$$

- $\boldsymbol{Treat_t^I}$ **is expenditure on black market lotteries** (% of total consumption expenditures) **between Jun 2000 to May 2003**
- $\boldsymbol{Post_m^{2006}}$ is a binary for the month on or after Dec 2006

**Note:* Y_{im} is the outcome of household i in month m; α_i is a household fixed effect; γ_m is a month fixed effect; X_{im} is other covariates; $\in_m$ is an error term

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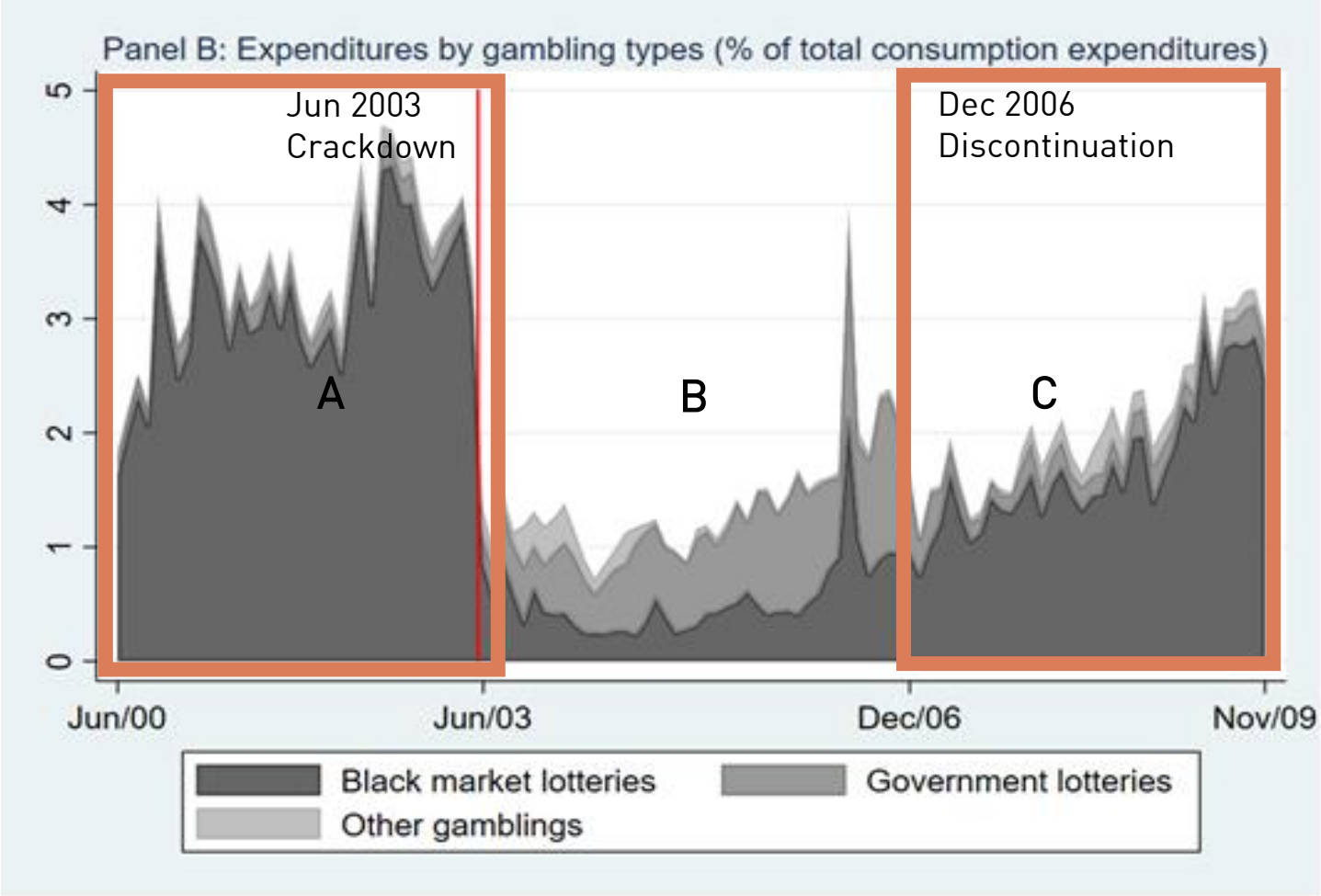

Source: Townsend Household Financial Accounting (1-172) merged with Monthly Resurveys
*Sep 1998 – Dec 2014

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Households significantly decrease expenditures on gamblings

Period A & C

	ESTIMATE	STANDARD ERROR	PARALLEL TREND ASSUMPTION
Expenditure			
On government lotteries	-0.01***	0.00	√
On black market lotteries	-0.78***	0.02	Underestimated magnitude
On other types of gamblings	-0.02***	0.00	√
On alcohol, tobacco, and eating out	0.01	0.01	√
Other food consumption expenditures	0.40***	0.03	☒
Other non-food consumption expenditures	0.40***	0.03	√

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Period A & C

	ESTIMATE	STANDARD ERROR	PARALLEL TREND ASSUMPTION
Other expenditures			
On tickets for concerts, museums, games etc.	0.0005	0.001	√
On sports fees and equipment	0.0001	0.0003	√
On cosmetics, soaps, shampoos, toothpaste etc.	0.02***	0.0058	☒
On services e.g. haircut, manicure, massage etc.	0.001	0.002	√
On maintenance of house and private vehicles	0.28	0.20	√
On education	0.178***	0.016	☒
On training	0.0008	0.0008	√
On health	-0.006	0.009	√

*The surveyed households consisted of 710 household engaging in at least one interview between June 2000 and Nov 2009. All of the outcomes were measured as percentages of household's total expenditure on consumption goods and services (including both food and non-food (e.g. gasoline, utilities, rent, clothes, transportation) items). The pre-crackdown period = June 2000 – May 2003. The post-discontinuation period = Dec 2006 - Nov 2009. The effects were estimated with a fixed-effects model using the within regression estimator with household fixed effects, adjusting for month fixed effects. Standard errors were clustered at the household level. *** p←0.001, ** p←0.01, * p←0.05

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Probit Model

5. Investigate the characteristics of various types of households

using data between June 2000 and November 2009

$$D_i = \alpha + \beta_1 mean\_age_i + \beta_2 mean\_edu_i + \beta_3 hh\_member_i + \beta_4 adult_i + \beta_5 kid_i + \beta_6 headmale_i + \beta_7 liabilities_i + \beta_8 net\_wealth_i + \beta_9 assets_i + \epsilon_i$$

where

D_i is the log likelihood of household of certain characteristics

α is a constant

Other RHS are household variables

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Examples of household of certain characteristics (LHS)

	No. of households who engaged in...	
	ช่วง A (Jun 2000 – May 2003)	ช่วง B (Jun 2003 – Nov 2006)
1	Govt = 0 & Black = 0	Govt = 0 & Black = 0
2	Govt = 0 & Black = 0	Govt = 1 & Black = 0
3	Govt = 0 & Black = 0	Govt = 0 & Black = 1
4	Govt = 0 & Black = 0	Govt = 1 & Black = 1
5	Govt = 1 & Black = 0	Govt = 0 & Black = 0
6	Govt = 1 & Black = 0	Govt = 1 & Black = 0
7	Govt = 1 & Black = 0	Govt = 0 & Black = 1
8	Govt = 1 & Black = 0	Govt = 1 & Black = 1
9	Govt = 0 & Black = 1	Govt = 0 & Black = 0
10	Govt = 0 & Black = 1	Govt = 1 & Black = 0
11	Govt = 0 & Black = 1	Govt = 0 & Black = 1
12	Govt = 0 & Black = 1	Govt = 1 & Black = 1
13	Govt = 1 & Black = 1	Govt = 0 & Black = 0
14	Govt = 1 & Black = 1	Govt = 1 & Black = 0
15	Govt = 1 & Black = 1	Govt = 0 & Black = 1
16	Govt = 1 & Black = 1	Govt = 1 & Black = 1

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The older and more educated tend to correlate with no-gambling behavior

Probit result of no-gambling households

No-gambling households	ESTIMATE	STANDARD ERROR
Average age of household members	**0.02***	0.01
Average education level of household members	**0.12***	0.05
Number of household members	0.04	0.12
Number of adults	-0.11	0.14
Number of kids	0.27	0.20
Male as head of household	-0.01	0.19
Household's total liabilities	-0.00	0.00
Household's net wealth	0.00	0.00

*** p←0.001, ** p←0.01, * p←0.05

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Male household heads and higher levels of debt are associated with constant-gambling-involvement households

Probit result of constant-gambling-involvement households

No-gambling households	ESTIMATE	STANDARD ERROR
Average age of household members	-0.01	0.01
Average education level of household members	-0.01	0.04
Number of household members	0.08	0.09
Number of adults	-0.09	0.11
Number of kids	-0.25	0.17
Male as head of household	**0.41****	0.16
Household's total liabilities	**0.01****	0.00
Household's net wealth	0.00	0.00

*** p←0.001, ** p←0.01, * p←0.05

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Summary of Findings

- The supply-side intervention, particularly the crackdown, was **effective** in eliminating the black-market lotteries
- The substitution from black-market lotteries to government lotteries was **statistically significant but small**, whereas the substitution from government lotteries to black-market lotteries **was statistically significant and large**
- The 2003 supply-side intervention of lottery business **had a long-term impact on changing households' gambling behavior**, i.e., the households significantly decrease expenditures on the black-market lotteries, government lotteries and other types of gamblings
- The older and more educated tend to correlate with no-gambling behavior
- Male household heads and higher levels of debt are associated with constant-gambling-involvement households

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Discussion and Policy Recommendation

- **At least in the short run, supply-side intervention, particularly the crackdown, was effective in eliminating the black-market lottery**
  - Rapid rate of black-market lottery -→ government lottery, in contrast to government lottery -→ black-market lottery which took longer time to reach the pre-crackdown level
- **Degree of Substitutability (government lottery-→ black-market lottery) > Degree of Substitutability (black-market lottery-→ government lottery)**
  - The black-market lottery is still more appealing, e.g., in terms of prize variety, higher prize ratios
  - The black market has many dealers who must compete (competitive market) whereas government lottery is solely owned by the state (monopoly)

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Discussion and Policy Recommendation

- **The 2003 supply-side intervention had persistent effects in terms of changing households' gambling behavior and preferences in the long run**
  - The intervention induced households' persistent behavior to significantly decrease expenditures on the black-market lotteries, government lotteries and other types of gamblings
  - This supply-side intervention has the potential to reduce gambling demand, in addition to providing the government with a larger source of revenue and the benefits of eliminating the underground economy
- **A target-specific policy to reduce gambling should also be designed and implemented**
  - A fragility group has distinctive characteristics, i.e., households with a history of constant gambling involvement are more likely to be headed by men and related to higher debt

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Thank you!

Please Stay Tuned for the Full Paper...