Public Goods

ECON 3003
Advanced Public Economics

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Overview

- So far we've been focused on:
  1. How governments can design income taxes and transfers optimally
  2. How people respond to taxes (real, avoidance, and evasion responses)
  3. Who bears the burden of a tax (economic incidence) — and briefly how govt can set commodity taxes optimally (Ramsey rule)
  4. How governments can enforce taxes (A-S model) + evidence
- Today: understand how govts can provide public goods optimally, consequences of private provision, and charitable giving as an application

PUBLIC GOODS: DEFINITIONS

- **Pure public goods**: Goods that are perfectly **non-rival in consumption** and are **non-excludable**
  - **Non-rival in consumption**: One individual's consumption of a good does not affect another's opportunity to consume the good
  - **Non-excludable**: Individuals cannot deny each other the opportunity to consume a good
- **Impure public goods**: Goods that satisfy the two public good conditions (non-rival in consumption and non-excludable) to some extent, but not fully

7.1

Defining Pure and Impure Public Goods

		Is the good rival in consumption?	
		Yes	No
Is the good excludable?	Yes	Private good (ice cream)	Impure public good (Cable TV)
	No	Impure public good (crowded sidewalk)	Public good (defense)

OPTIMAL PROVISION OF PRIVATE GOODS

Two goods: ic (ice-cream) and c (cookies) with prices P_{ic}, P_c

$P_c = 1$ is normalized to one (numéraire good):

Two individuals B and J demand different quantities of the good at the same market price.

$MRS_{ic,c} = MU_{ic}/MU_c = \#$ cookies the consumer is willing to give up for 1 ice-cream

The optimality condition for the consumption of private goods is written as: $MRS^B_{ic,c} = MRS^J_{ic,c} = P_{ic}/P_c = P_{ic}$

Equilibrium on the supply side requires: $MC_{ic} = P_{ic}$

In equilibrium, therefore: $MRS^B_{ic,c} = MRS^J_{ic,c} = MC_{ic}$

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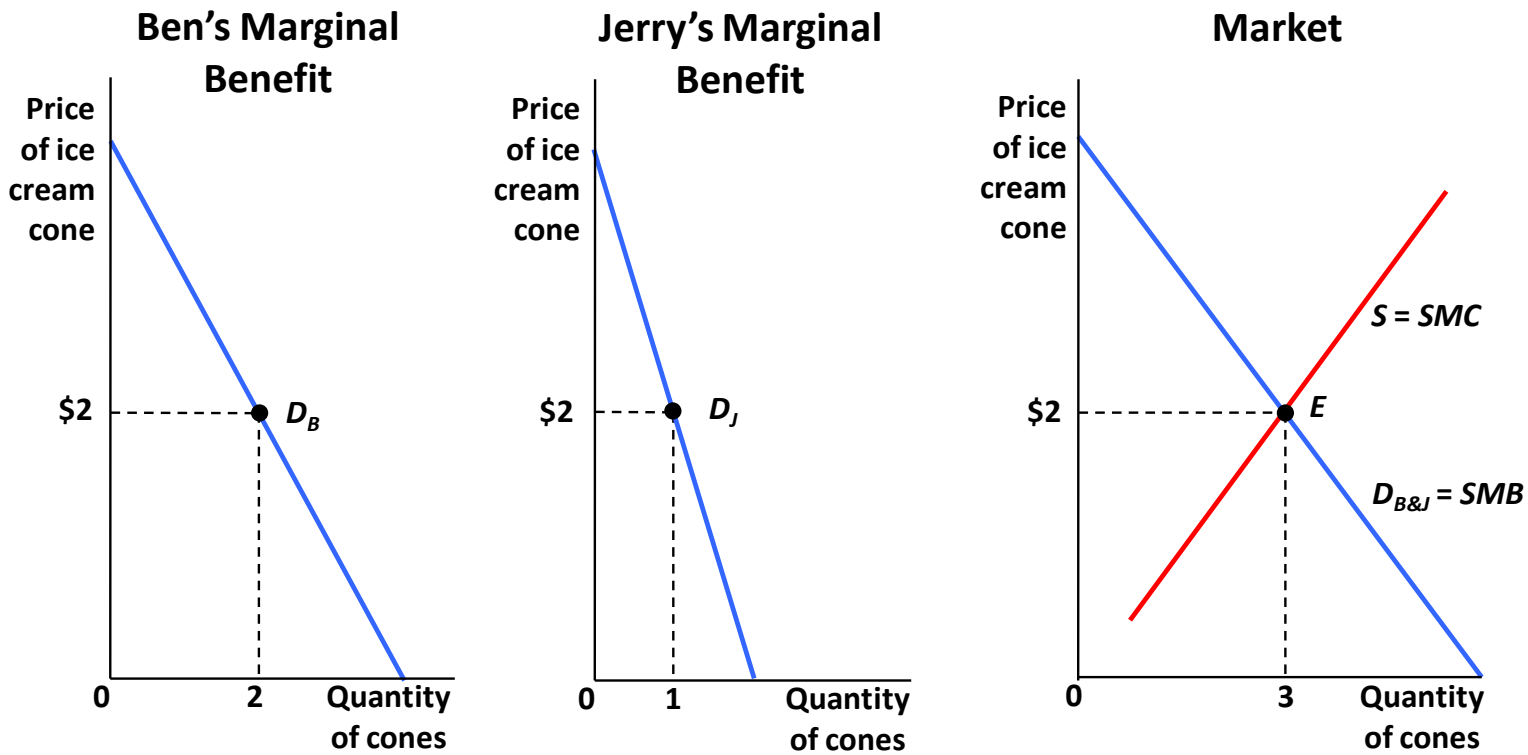
Horizontal Summation in the Private Goods Market



- To find social demand curve, add quantity at each price—sum horizontally.

OPTIMAL PROVISION OF PUBLIC GOODS

Replace private good ice-cream *ic* by a public good missiles *m*

$MRS^B_{m,c}$ = # cookies B is willing to give up for 1 missile

$MRS^J_{m,c}$ = # cookies J is willing to give up for 1 missile

In net, society is willing to give up $MRS^B_{m,c} + MRS^J_{m,c}$ cookies for 1 missile

Social-efficiency-maximizing condition for the public good is:

$$MRS^B_{m,c} + MRS^J_{m,c} = MC_m$$

Social efficiency is maximized when the marginal cost is set equal to the *sum of the MRSs, rather than being set equal to each individual MRS*.

This is called the **Samuelson rule** (Samuelson, 1954)

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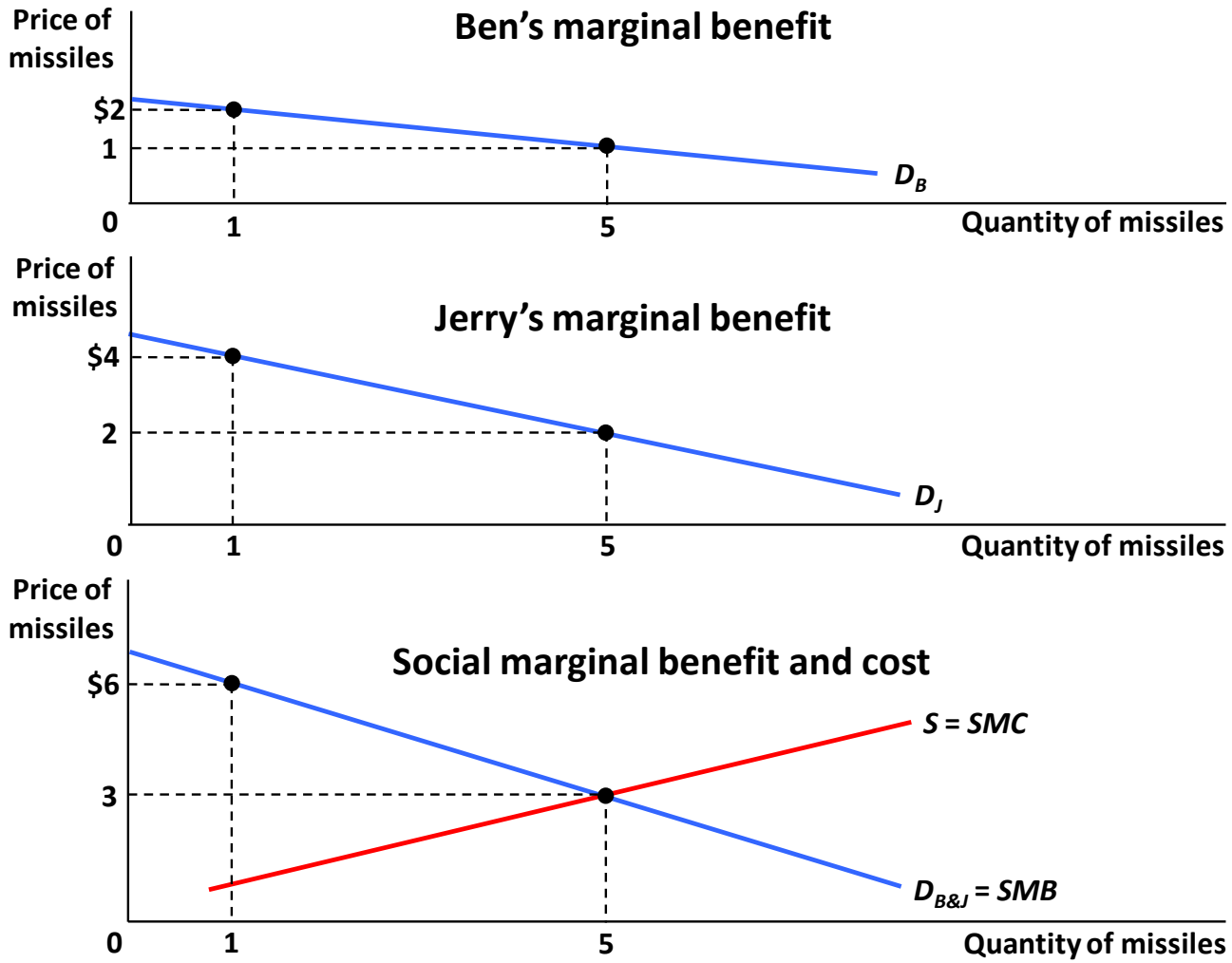
Vertical Summation in the Public Goods Market



PRIVATE-SECTOR UNDERPROVISION

Private sector provision such that $MRS^i_{mc} = MC_m$ for each individual i so that $\sum_i MRS^i_{mc} > MC_m \Rightarrow$ Outcome is not efficient, could improve the welfare of everybody by having more missiles (and less cookies)

Free rider problem: When an investment has a personal cost but a common benefit, selfish individuals will underinvest.

Because of the **free rider** problem, the private market undersupplies public goods

Another way to see it: private provision of a public good creates a **positive externality** (as everybody else benefits)
$\Rightarrow$ Goods with positive externalities are under-supplied by the market

PRIVATE PROVISION OF PUBLIC GOOD

2 individuals with identical utility functions defined on X private good (cookies) and F public good (fireworks)

$F = F_1 + F_2$ where F_i is contribution of individual i

Utility of individual i is $U_i = 2\log(X_i) + \log(F_1 + F_2)$ with budget $X_i + F_i = 100$

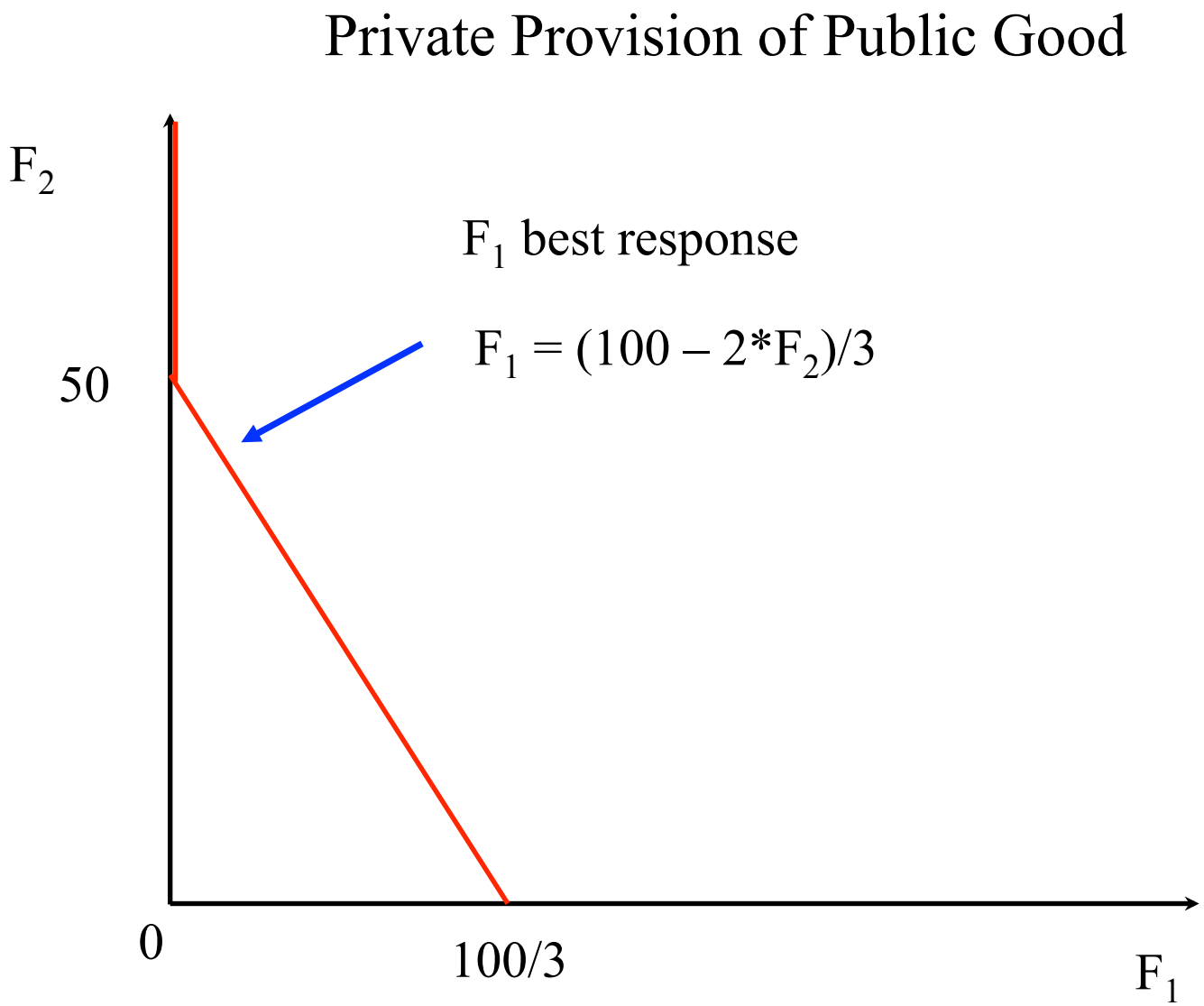
Individual 1 chooses F_1 to maximize $2\log(100 - F_1) + \log(F_1 + F_2)$ taking F_2 as given

First order condition:
$-2/(100 - F_1) + 1/(F_1 + F_2) = 0 \Rightarrow F_1 = (100 - 2F_2)/3$

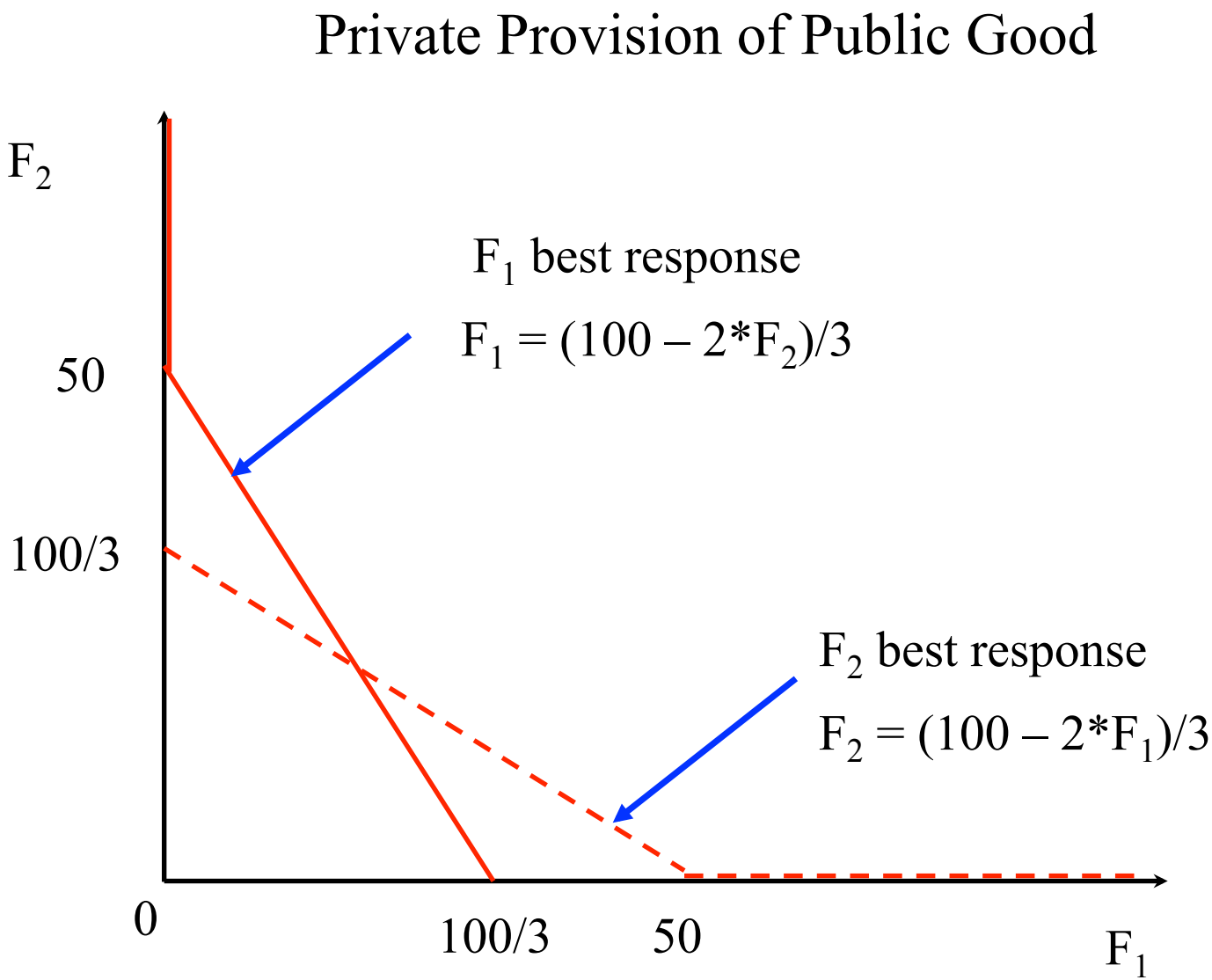
Note that F_1 goes down with F_2 due to the free rider problem (called the reaction curve)

Symmetrically, we have $F_2 = (100 - 2F_1)/3$

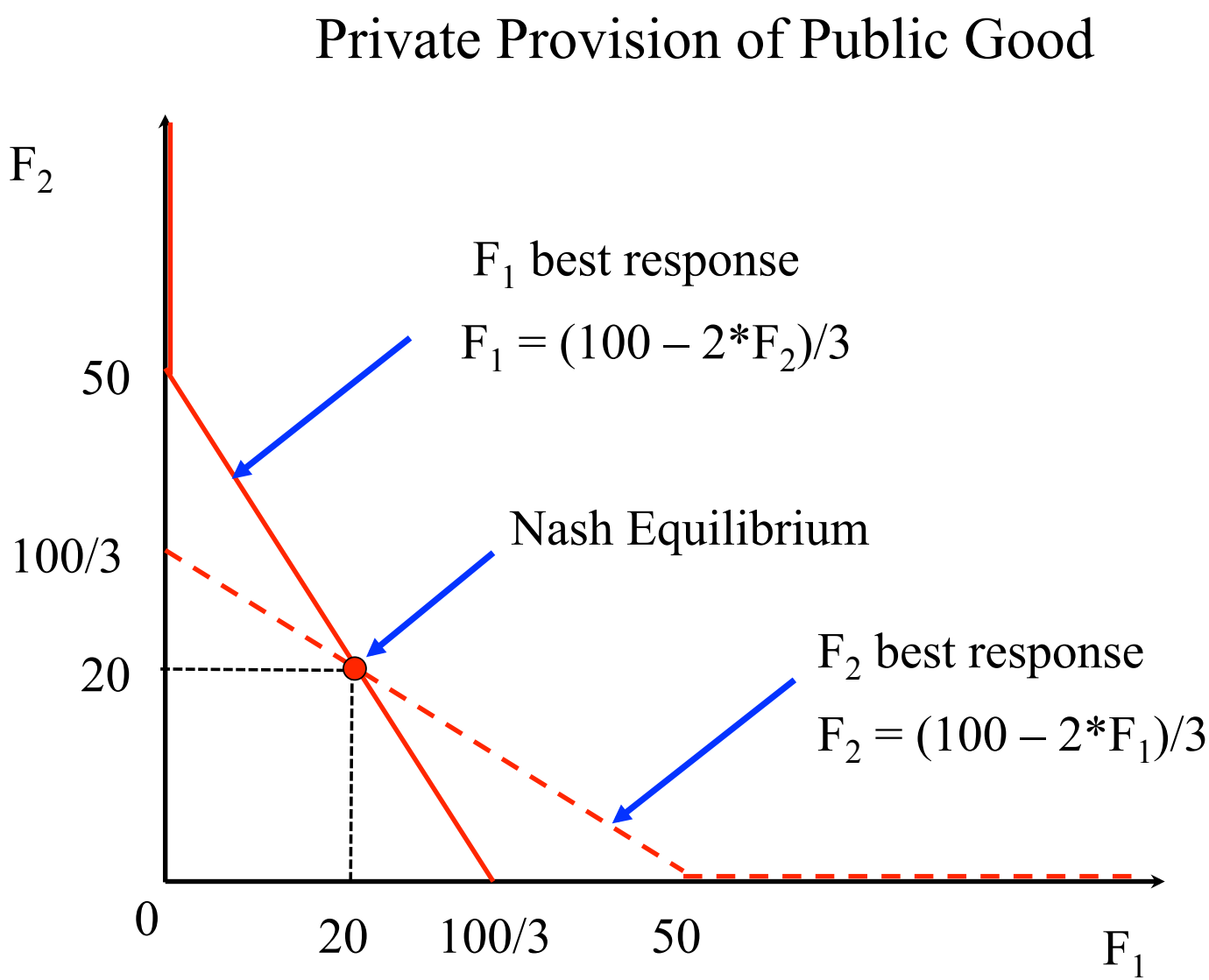
Reaction curves and Nash Equilibrium



Reaction curves and Nash Equilibrium



Reaction curves and Nash Equilibrium



PRIVATE PROVISION OF PUBLIC GOOD

Nash equilibrium definition: Each agent maximizes his objective taking as given the actions of the other agents

At the Nash equilibrium, the two reaction curves intersect:

$F_1 = (100 - 2F_2)/3$ and $F_2 = (100 - 2F_1)/3$

$\Rightarrow F_1 + F_2 = (200 - 2(F_1 + F_2))/3 \Rightarrow F = F_1 + F_2 = 200/5 = 40 \Rightarrow F_1 = F_2 = 20$

What is the Social Optimum? $\sum_i MRS^i = MC = 1$

$MRS^i_{FX} = MU^i_F/MU^i_X = (1/(F_1 + F_2))/(2/X_i) = X_i/2F$

$\Rightarrow \sum_i MRS^i = (X_1 + X_2)/2F = (200 - F)/2F$

$\Rightarrow \sum_i MRS^i = 1 \Rightarrow 200 - F = 2F \Rightarrow F = 200/3 = 66.6 > 40$

Public good is under-provided by the market

Can Private Provision Overcome Free Rider Problem?

The free rider problem does not lead to a complete absence of private provision of public goods. Private provision works better when:

1) **Some Individuals Care More than Others:**

Private provision is particularly likely to surmount the free rider problem when individuals are not identical, and when some individuals have an especially high demand for the public good

2) **Altruism:**

When individuals value the benefits and costs to others in making their consumption choices

3) **Warm Glow:**

Model of public goods provision in which individuals care about both the total amount of the public good and their particular contributions as well

Experimental evidence on free riding

Laboratory experiments are a great device to test economic theories

Subjects (often students) are brought to the lab where they sit through a computer team game and get paid based on the game outcomes

Many public good lab experiments. Example (Marwell and Ames 1981):

- 10 repetitions for each game
- In each game, group of 5 people, each with 10 tokens to allocate between cash and public good
- If take token in cash, get \$1 in cash for yourself. If contribute to common good, get \$0.5 to each of all five players

Nash equilibrium: get everything in cash
Socially optimal equilibrium: contribute everything to public good

In the lab, subjects contribute about 50% to public good, but public good contributions fall as game is repeated (Isaac, McCue, and Plott, 1985)

Explanations: people are willing to cooperate at first but get upset and retaliate if others take advantage of them

Why Do People Cooperate?

- In standard economic models, individuals are selfish and hence play Nash and don't cooperate
- But humans are social beings that constantly interact and cooperate at many levels (family, work, friends, community, etc.)
- Cooperation is innate and supported by sense of fairness and willingness to punish non-cooperators (altruistic punishment)
- Likely due to evolutionary adaptation
- Many lab experiments have explored "fairness" aspects of human behavior (Fair and Schmidt, 1999)
- But these "social" aspects haven't integrated mainstream economics much yet, a serious limitation especially for public economics

Crowding out of private contributions by govt provision

Suppose government forces each individual to provide 5 so that now $F = F_1 + F_2 + 10$ where F_i is voluntary contribution of individual i

Utility of individual i is $U_i = 2\log(X_i) + \log(F_1 + F_2 + 10)$ with budget $X_i + F_i = 95$

You will find that the private optimum is such that $F_1 = F_2 = 15$ so that government forced contribution crowds out one-to-one private contributions

Why? Rename $F_i' = F_i + 5$. Choosing F_i' is equivalent to choosing F_i: $U_i = 2\log(X_i) + \log(F_1' + F_2')$ with budget $X_i + F_i' = 100$

$\Rightarrow$ Equivalent to our initial problem with no government provision hence the solution in F_i' must be the same

However, government forced contributions will have an effect as soon as private contributions fall to zero (as individuals cannot contribute negative amounts and undo government provision)

EMPIRICAL EVIDENCE ON CROWD-OUT

Crowd-out: Reduction in private contributions to a public good due to an increase in goverment provision of the public good.

Two strands of empirical literature:

1) Field evidence (observational studies)

2) Lab and field experiments

Lab experiments show imperfect crowd-out in public good games (where you compare situation with no forced public goods contributions and with forced public good contributions). See Andreoni (1993)

Lab experiment may not capture important motives for giving: warm glow, prestige, solicitations from fund raisers

CHARITABLE GIVING

Charitable giving is one form of private public good provision

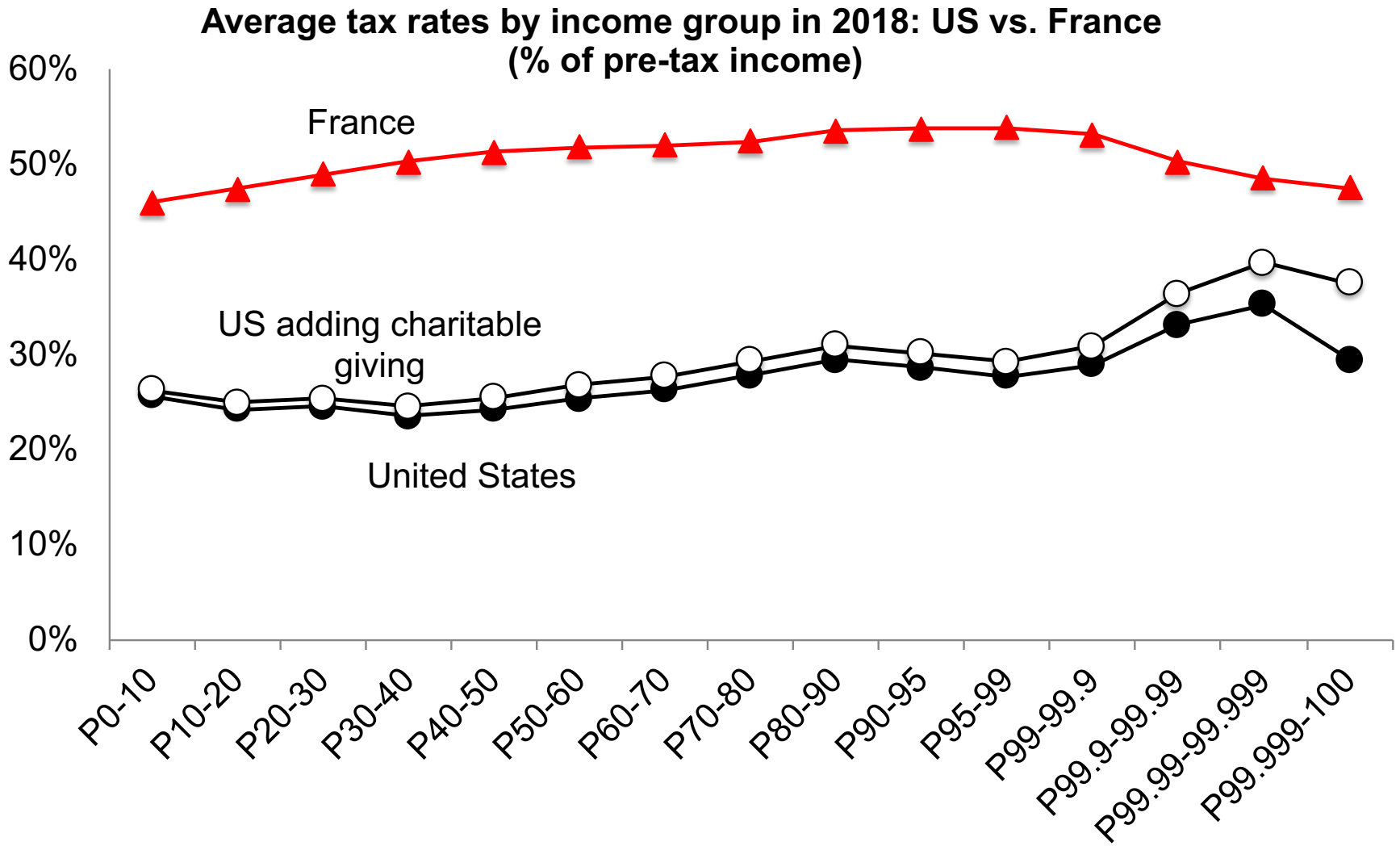
- Big in the US, 1.5% of National Income given to charities

Funds (1) religious activities, (2) education, (3) human services, (4) health, (5) arts, (6) other causes (environment, animal protection, etc.)

Encouraged by govt: Most income tax systems provide preferential treatment to charitable donations through deductions or tax credits

But policy is potentially costly for the government

- Gift Aid program in the UK (tax relief for charitable donations) cost £1.8bn in foregone revenue in 2015/16


Average tax rates by income group in 2018: US vs. France
(% of pre-tax income)
60%
50%
40%
30%
20%
10%
0%
France
US adding charitable giving
United States
P0-10
P10-20
P20-30
P30-40
P40-50
P50-60
P60-70
P70-80
P80-90
P90-95
P95-99
P99-99.9
P99.9-99.99
P99.99-99.999
P99.999-100

CHARITABLE GIVING

- Standard economic theory suggests that subsidizing charitable giving may be desirable if it induces a large enough increase in donations (Saez, 2004)
- To evaluate the welfare implications of these tax reliefs, one of the key parameters needed is the **elasticity of charitable donations with respect to their tax price**

UK Gift Aid program

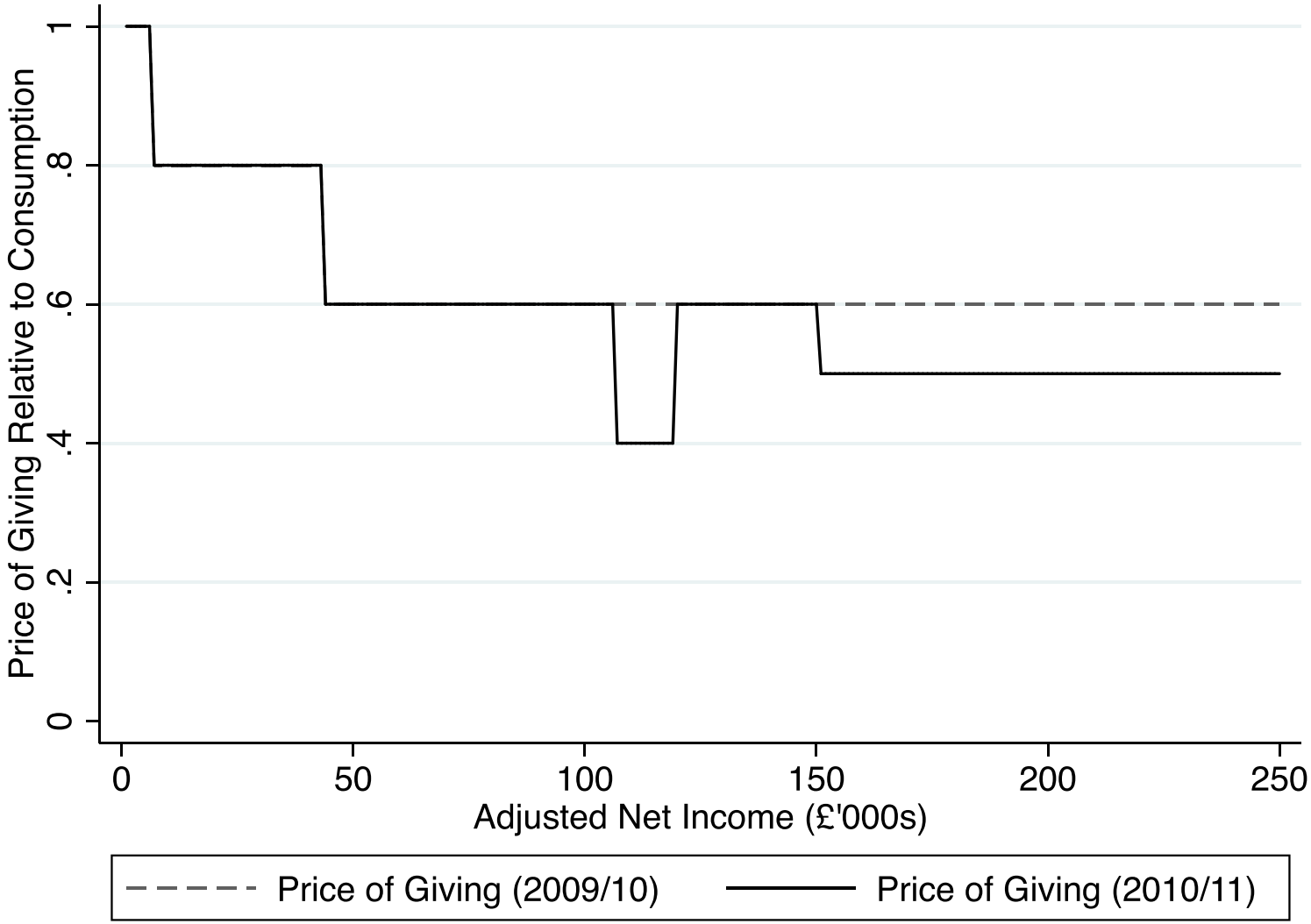
- The UK income tax system provides for the full deduction of charitable donations from taxable income
- When a UK taxpayer donates to charity, she fills out and gives a Gift Aid declaration form to the charity along with the donation
- The charity can claim the income tax paid on the donated amount directly from HMRC [for a £1 donation, charity receives $1/(1-\tau_b)$]
- For the donor, the tax price of giving in terms of forgone consumption is $(1-\tau_b)$
- The price of giving for a higher-rate taxpayer is $(1-\tau_h)$

Almunia-Guceri-Lockwood-Scharf (JPubE 2020)

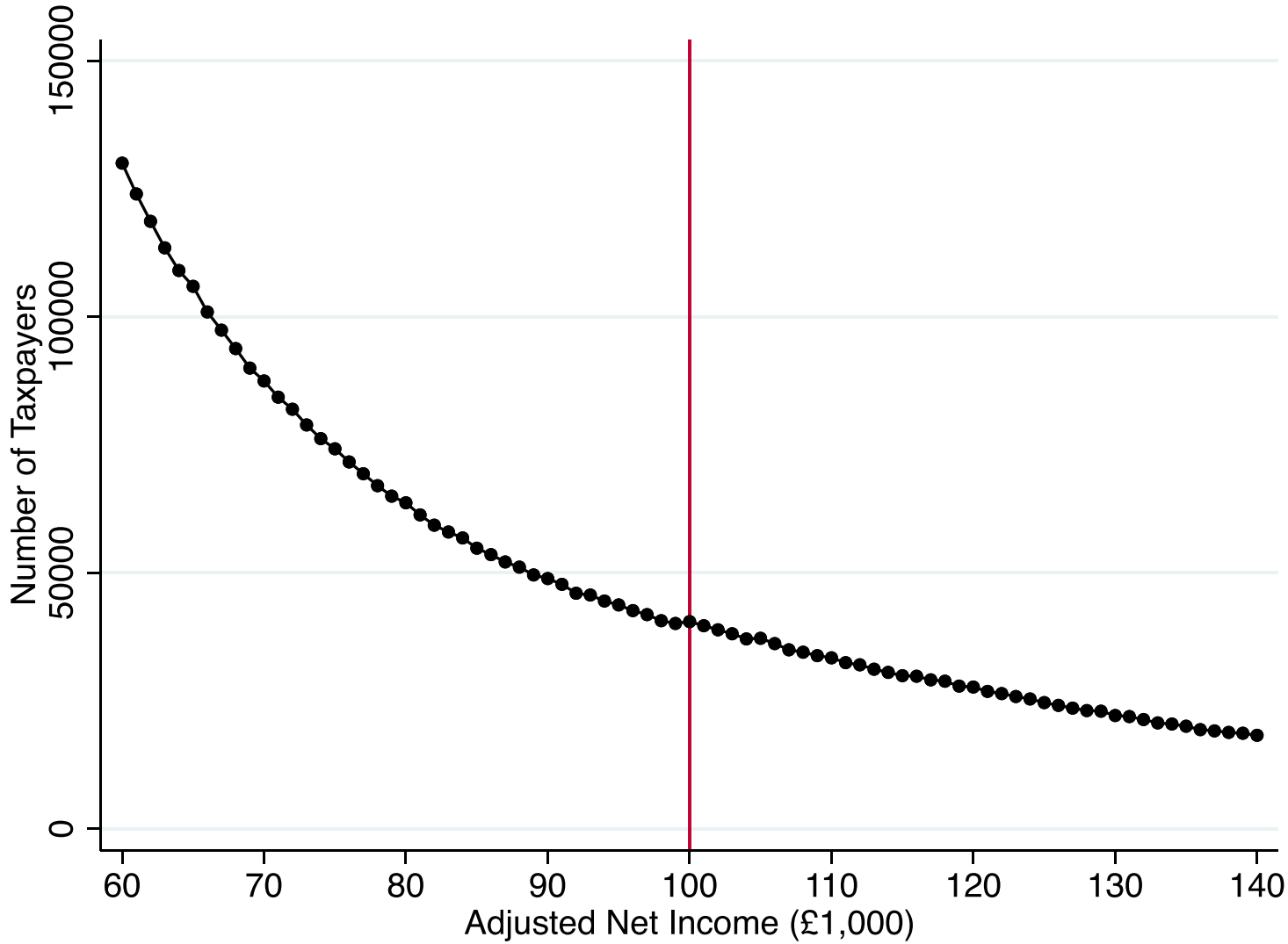
Estimate the effects of tax incentives on UK charitable contributions

- Use the universe of self-assessment income tax returns for 2005-2013
- Exploit variation from the 2010 reform to estimate intensive- and extensive-margin tax-price elasticities of giving
  - Top MTR ↑ from 40% to 50% above 150k
  - Created the "60% MTR trap" above 100k
- Find an elasticity of -0.3 (-0.2 intensive and -0.1 extensive margin)
- Propose a model with a fixed cost of declaring donations and estimate a cost of around £47 (intuition: some taxpayers make donations but don't claim the deduction in their tax return due to costs of making a deduction)

(a) Statutory Tax Price of Giving, Before and After 2010 Reform



Distribution of adjusted net income (pre/post reform)



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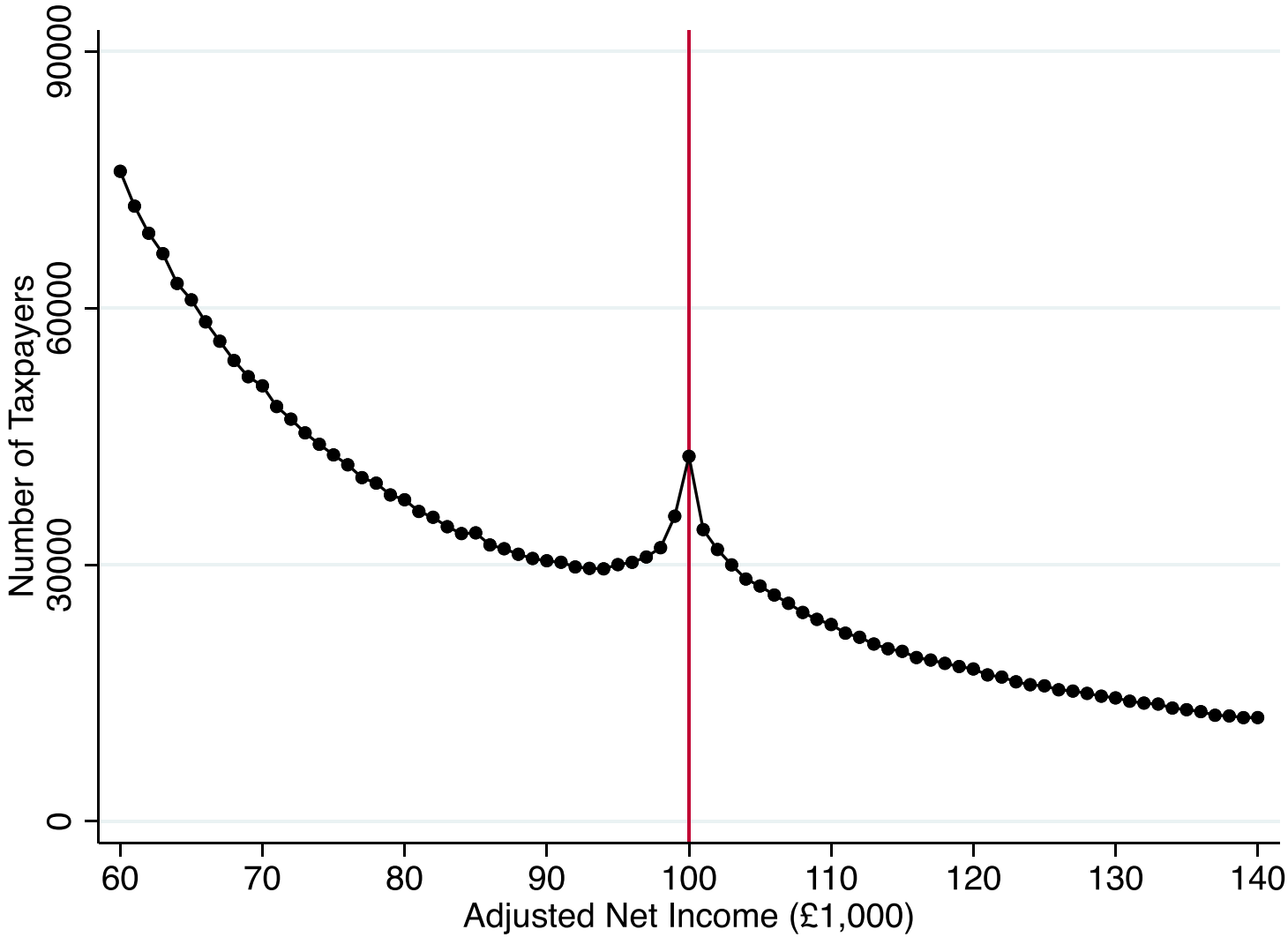
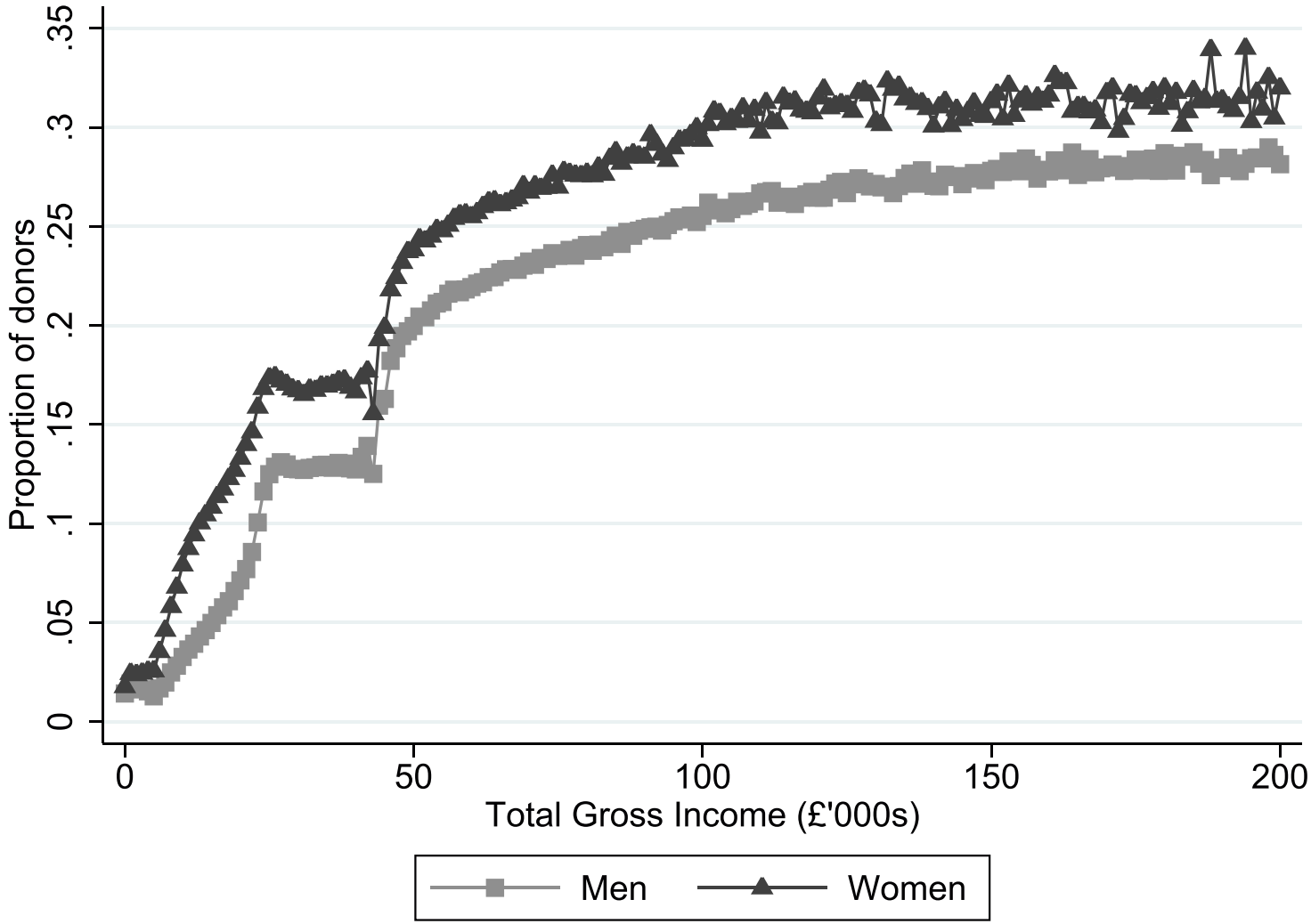
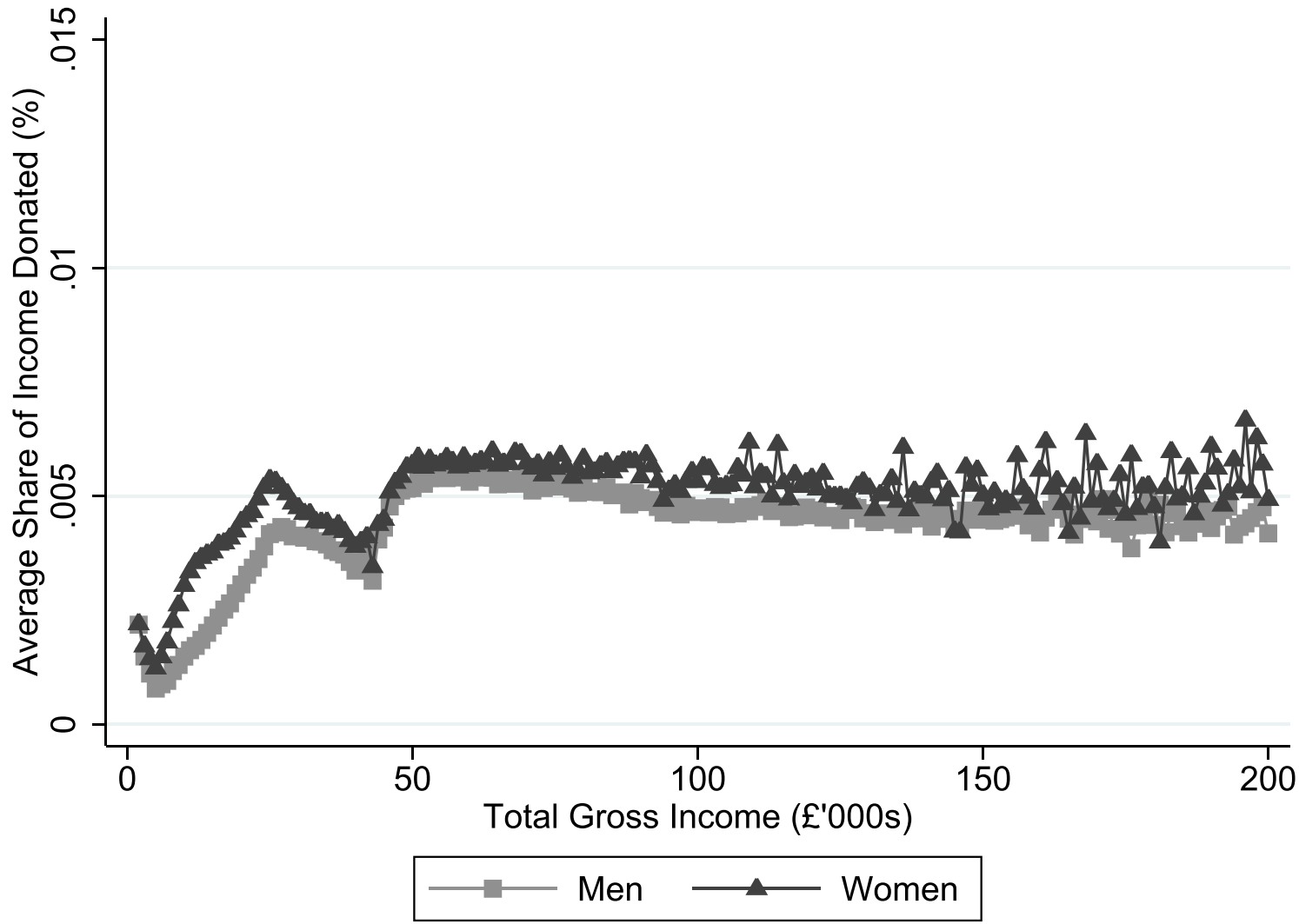


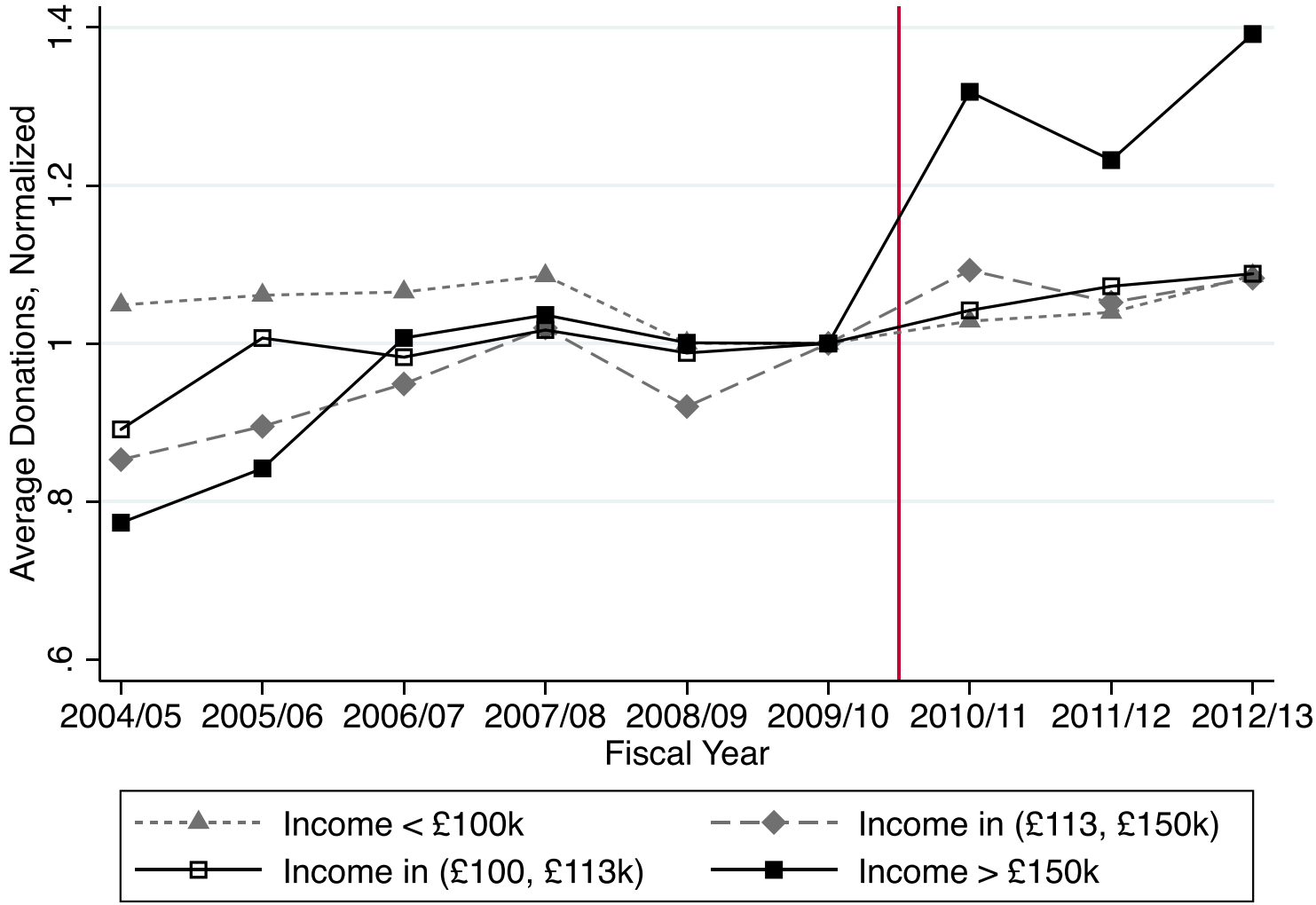
Share of SA taxpayers reporting donations



Average annual donations as a share of pre-tax income



Tax reform had an effect on giving behavior at the top of the income distribution



CHARITABLE GIVING

People give out of:

(1) warm-glow (name on building)
(2) reciprocity (alumni)
(3) social pressure (churches)
(4) altruism (poverty relief)

Those effects are not captured in basic economic model

Charities have big fund-raising operations to induce people to give based on those social/psychological effects

Empirical Evidence on Crowd-Out: Andreoni-Payne '03

Government spending crowds out private donations through two channels: willingness to donate + fundraising

Use tax return data on arts and social service organizations

Panel study: follows the same organizations overtime

Results: \$1000 increase in government grant leads to \$250 reduction in private fundraising

Suggests that crowdout could be non-trivial if fundraising is a powerful source of generating private contributions

Subsequent study by Andreoni and Payne confirms this

Find that \$1 more of government grant to a charity leads to 56 cents less private contributions → 70% (\$0.40) due to the fundraising channel

Suggests that individuals are relatively passive actors

Randomized field experiment to test reciprocity

Falk (2007) conducted a field experiment to investigate the relevance of reciprocity in charitable giving

In collaboration with a charitable organization, sent 10,000 Christmas solicitation letters for funding schools for street children in Bangladesh to potential donors (in Switzerland). Randomized into 3 groups:

1) **Control:** 1/3 of letters contained no gift
2) **Treatment 1:** 1/3 contained a small gift: one post-card (children drawings) + one-envelope
3) **Treatment 2:** 1/3 contained a larger gift: 4 post-cards (children drawings) + 4-envelopes

Likelihood of giving: 12% in control, 14% in treatment 1, 21% in treatment 2

"Large gift" was very effective (even relative to cost)

Empirical Evidence on Social Pressure

Dellavigna-List-Malmendier '12 design a door-to-door fundraiser randomized experiment:

- Control: no advance warning of fund-raiser visit
- Treatment group 1: flyer at doorknob informs about the exact time of solicitation (hence can seek/avoid fund-raiser)
- Treatment group 2: same as treatment 1 but flyer has a check box "Do not disturb"

Results (relative to control):

- Treatment group 1: 9-25% less likely to open door for fund-raiser, same (unconditional) giving
- Treatment group 2: a number of people opt out and (unconditional) giving is 28-42% lower

$\Rightarrow$ Social pressure is an important determinant of door-to-door giving and door-to-door fund-raising campaigns lower utility of potential donors

CONCLUSION

- A major function of govts at all levels is the provision of public goods
- In some cases, the private sector can provide public goods, but in general it will not achieve the optimal level of provision
- When there are problems with private market provision of public goods, govt intervention can potentially increase efficiency
- Whether that potential will be achieved is a function of both:
  - the ability of the govt to appropriately measure the costs and benefits of public projects
  - the ability of the govt to carry out the socially efficient decision

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