Progressive Fines and Tax Evasion

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Introduction

Introduction

- Modern tax systems rely on the self-declaration of tax liabilities
- Evasion leads to sizeable revenue losses
  - 20% of GDP in Europe (Murphy 2019)
  - Under-reporting is $\approx$ 18% in US with a tax gap of 500 billion
- Evasion deterrence is performed through audits
  - Positive probability of sustaining costs
    (fines, litigation costs, shame, stigma, etc.)
- Most tax systems entail progressivity in penalties
  - Mistakes punished lightly (or not at all)
  - Misdemeanors and Felony subject to different regimes
    - France: No fine if minor, 10/40/80%
    - Germany: Fine of 5/360 daily rates
    - Italy: Non-filing 120%-240%, Under-reporting 90% to 180%
    - Spain: Minor/Serious/Very Serious 50/100/150% + fine
- We study what is the role of fine structure in deterrence

Related Literature

Economics of Crime applied to Tax Evasion

- Becker, 1968; Allingham and Sandmo, 1972; Srinivasan, 1973; Yitzhaki 1974

Theoretical studies on fine structure

- Monetary fines vs. Felony (Pencavel, 1979)
- Retroactive penalties (Rickard et al., 1982)
- Interaction between tax progressivity and fines (Koskella, 1983)
- Maximal penalties and their limits (Cowell, 1985)
- Penalties and rewards (Falkinger and Walther 1991)

Experimental studies on fine size

- TEG in the lab, Friedland et al. (1978) (surveyed in Malézieux, 2018)
- Fine size (Kirchler et al., 2003, Park and Hyun, 2003, Choo et al., 2015, Alm and Malézieux, 2019)

Research Goals

- Experimentally test the impact of different fine structures on:
  - The **declarations** of individuals
  - Total **revenues** collected
- The fine structures (treatments) we consider are:
  - **Linear (lin)** - standard in models
  - **Progressive piece-wise linear (ppl)** - common in real-world tax systems
- We develop a model of our experiment to:
  - **Clarify** the incentives under different fine structures
  - Identify a **reasonable comparison** for different fine structures
  - Define a (perfectly rational) **baseline** to be compared to experimental evidence

Model

The Model

Our modelling setting follows Cowell (1990) and is fairly standard:

- Preferences are represented by $U(\bullet)$, with $U' > 0$
- **Pre-tax Income** Y
- **Income declared** $X \in [0, Y]$ is **taxed** with a linear rate t
- Individuals may **evade** (under-declare) an amount $Y - X = E$
- Declarations get audited with **probability** p
- If evasion is discovered, a **fine** $f(tE)$ is levied
  - **Linear** $f(tE) = f_{lin}(tE) = f_{lin}tE, f_{lin} > 1$
  - **Progressive piece-wise linear** $f(tE) = f_{ppw}(tE)$

The Model - Parameters of the Experiment

Our modelling setting follows Cowell (1990) and is fairly standard:

- Preferences are represented by $U(\bullet)$, with $U' > 0$
- Pre-tax Income $Y = 125$
- Income declared $X \in [0, Y]$ is taxed with a linear rate $t = .2$
- Individuals may evade (under-declare) an amount $Y - X = E$
- Declarations get audited with probability $p = .2$
- If evasion is discovered, a fine $f(tE)$ is levied
  - Linear $f(tE) = f_{lin}(tE) = f_{lin}tE, f_{lin} > 1$
  - Progressive piece-wise linear $f(tE) = f_{ppw}(tE)$

The Optimal Evasion

$$max_E \mathbb{E}[U] = (1-p)U(Y^{na}) + pU(Y^a)$$

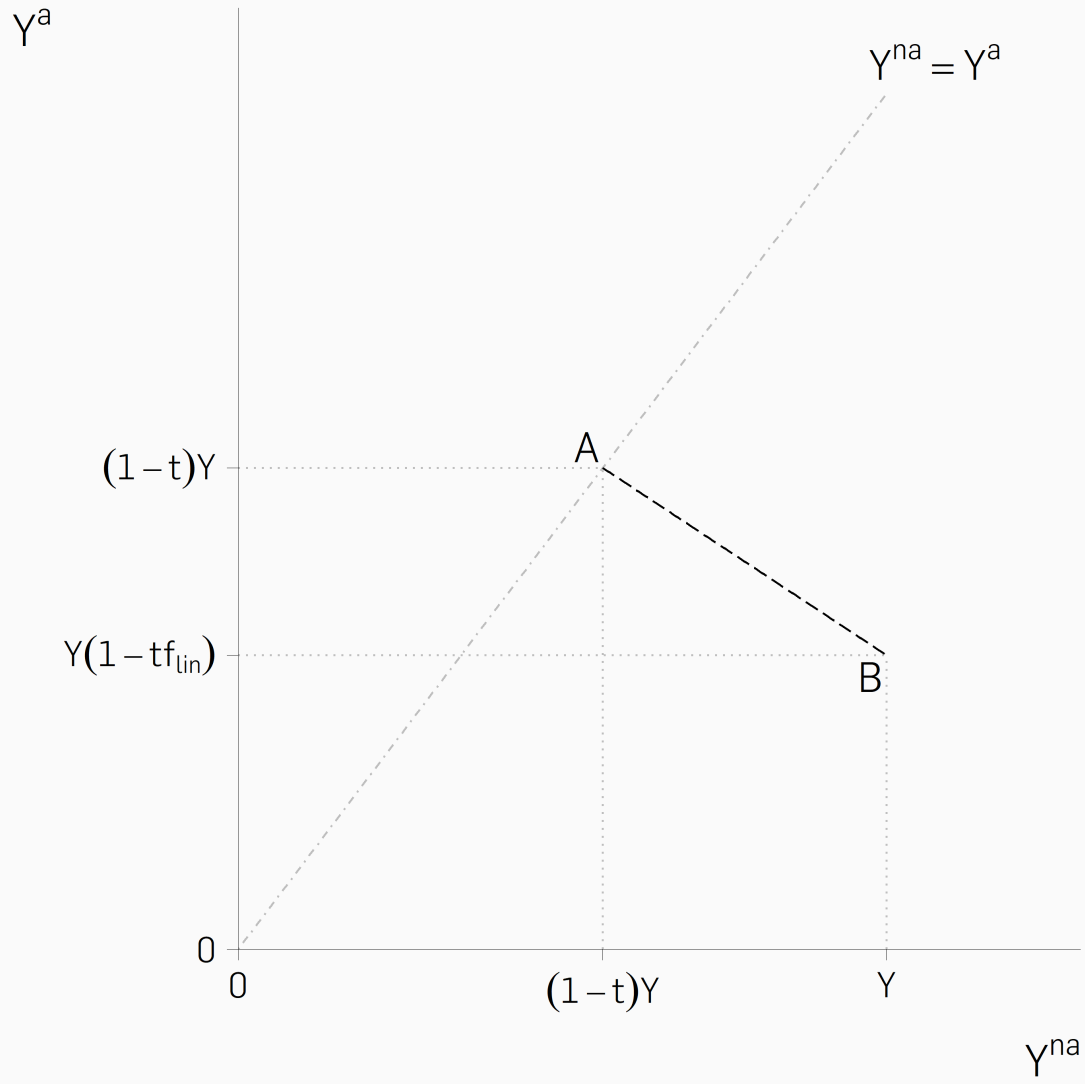
where:

$$Y^{na} = Y - tX$$

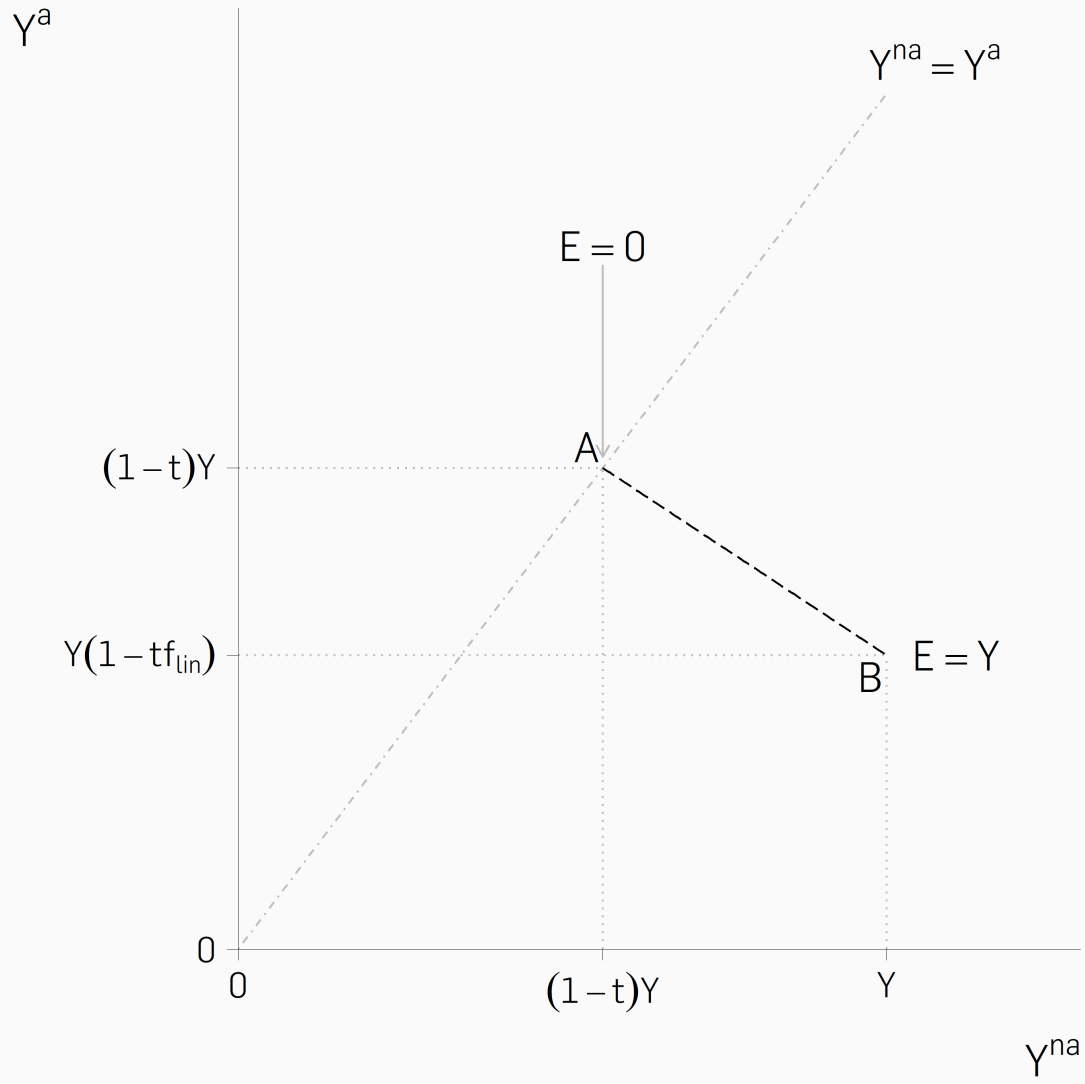
$$Y^a = Y - tX - f(tE)$$

If the fine rate is **linear** the model is analogous to Yitzhaki (1974)

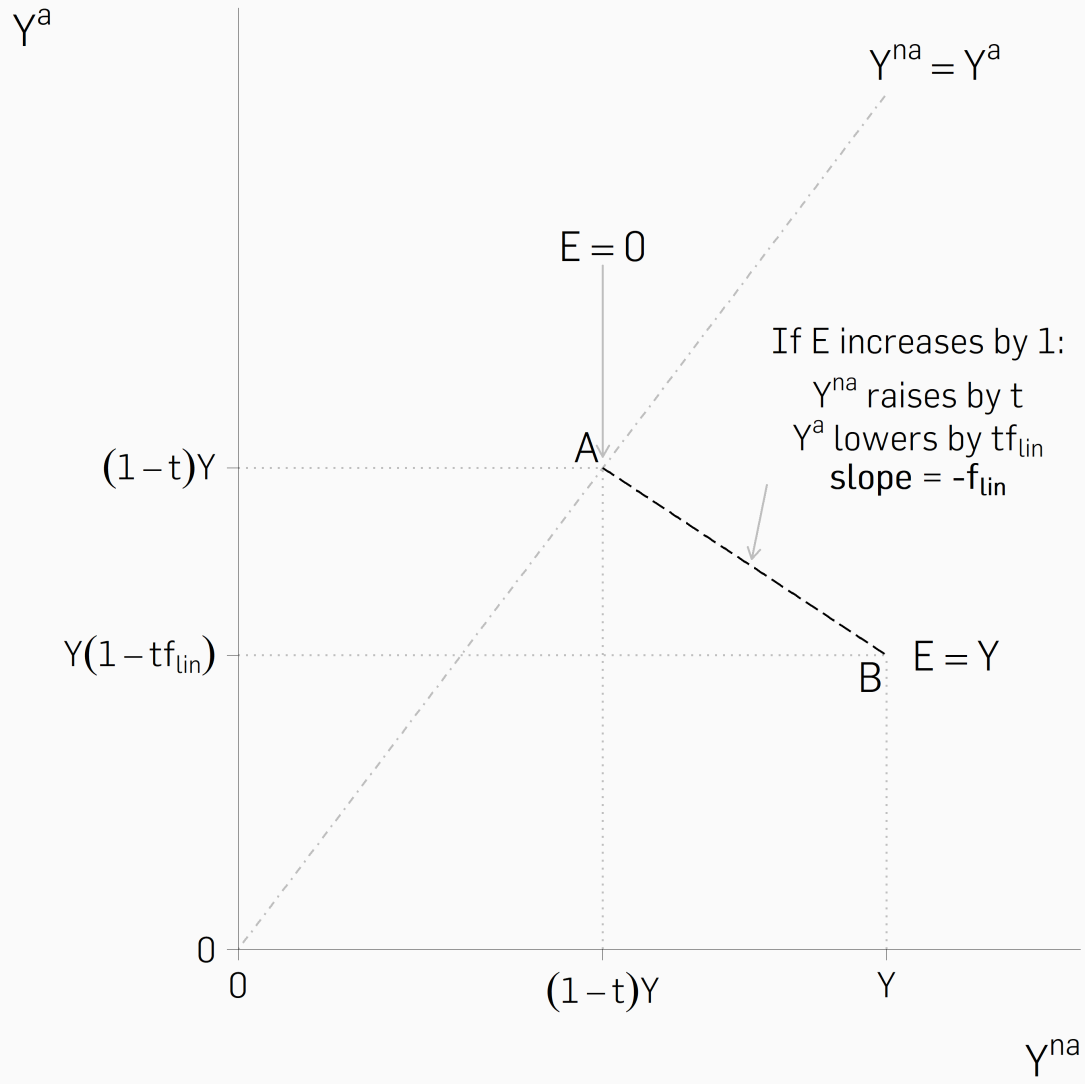
Evasion Choice and Linear Fine



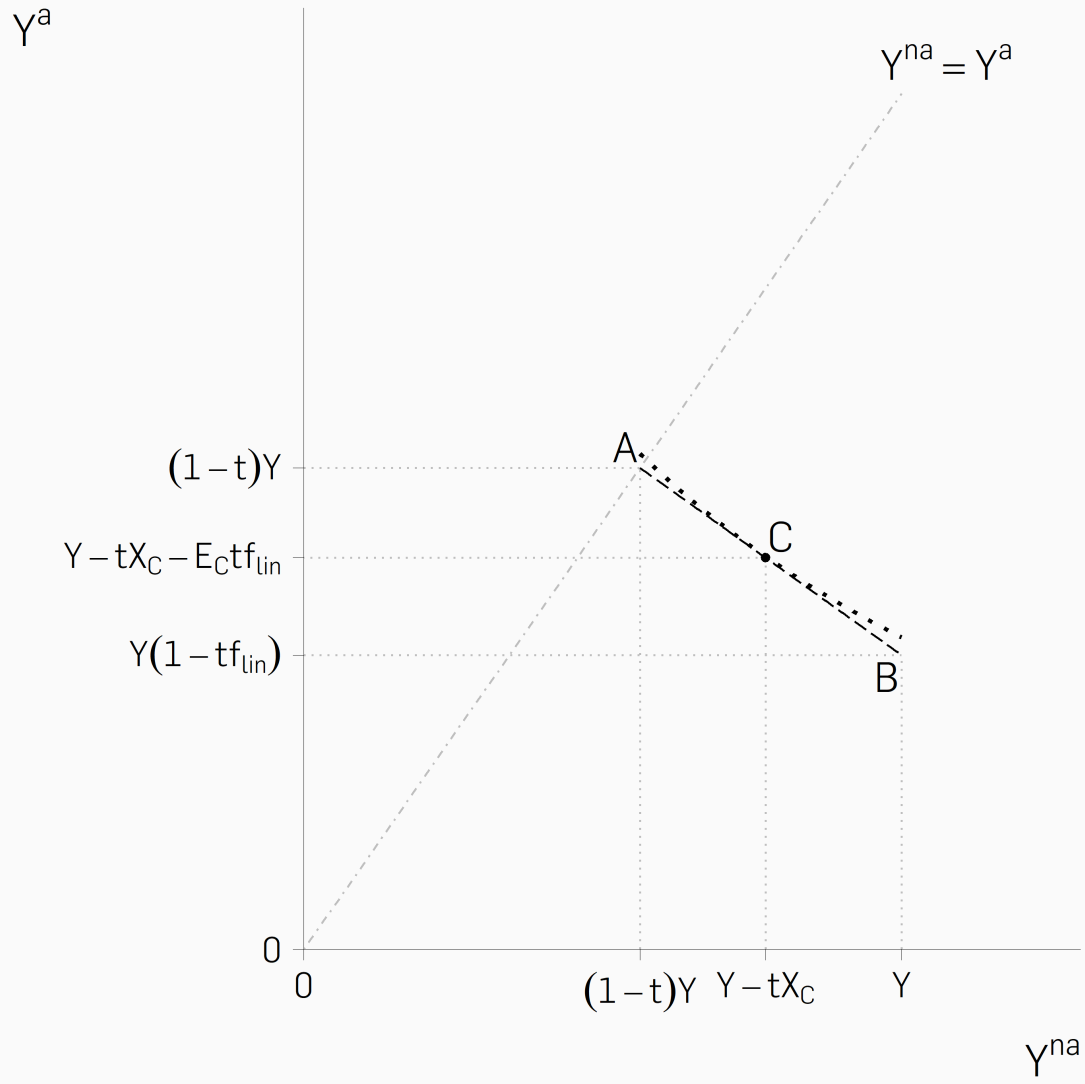
Evasion Choice and Linear Fine



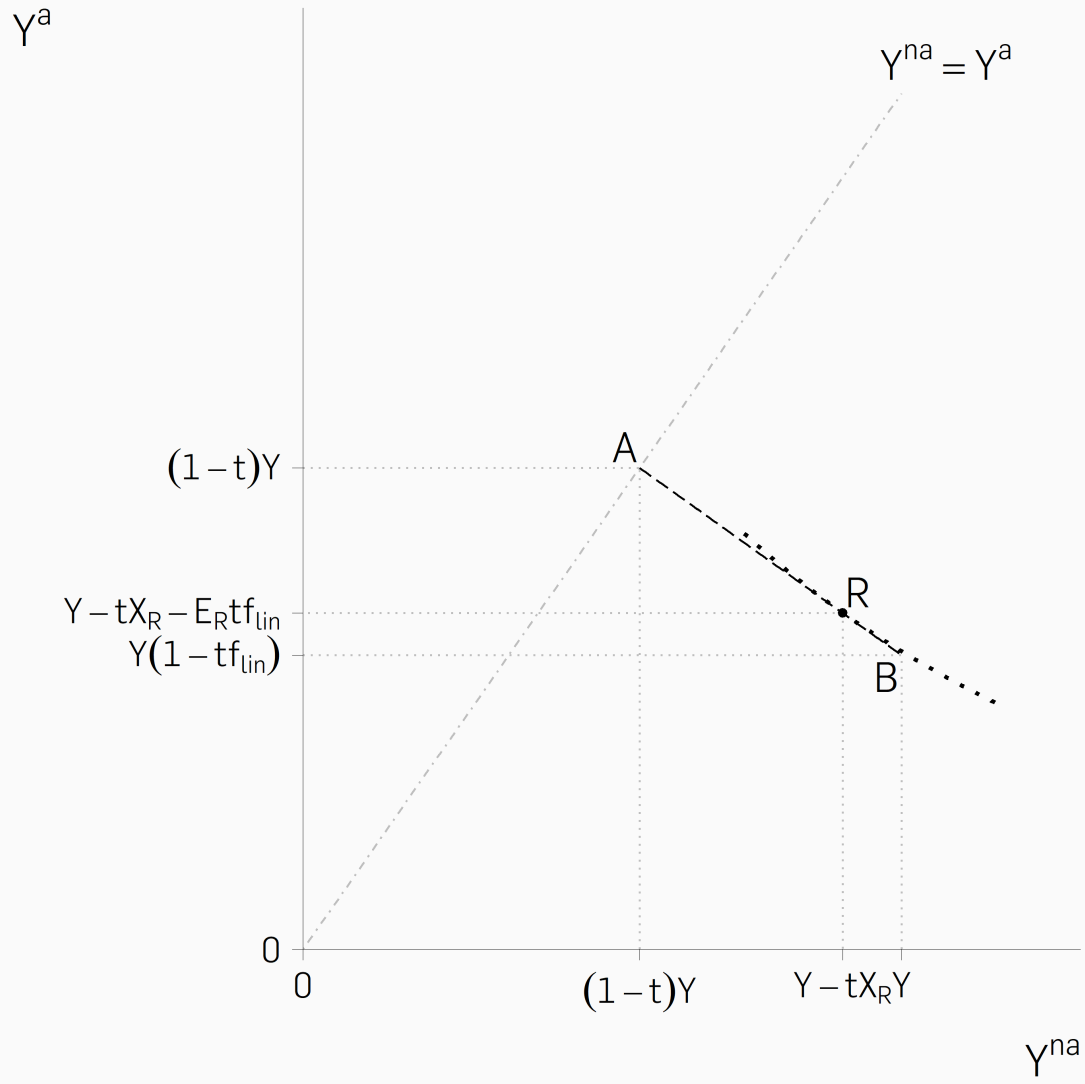
Evasion Choice and Linear Fine



Optimal Evasion with a Linear Fine



Optimal Evasion with a Linear Fine - Lower Risk Aversion



A Progressive Piece-wise Linear Fine

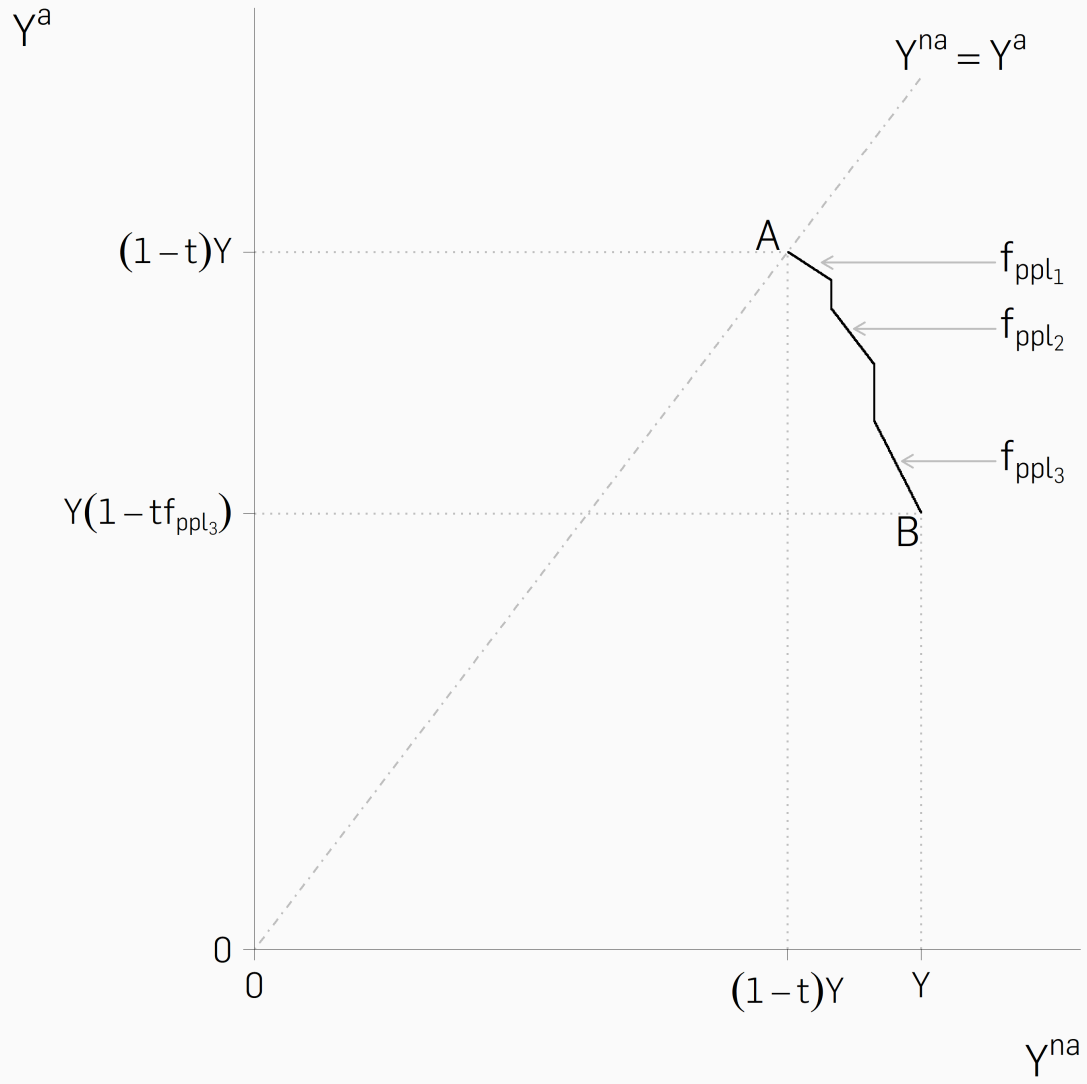
$$f_{ppl}(E) = \begin{cases} 0 & E = 0 \\ f_{ppl_1} & 0 < E < E_1 \\ f_{ppl_2} & E_1 \leq E < E_2 \\ f_{ppl_3} & E_2 \leq E \leq Y \end{cases}$$

where

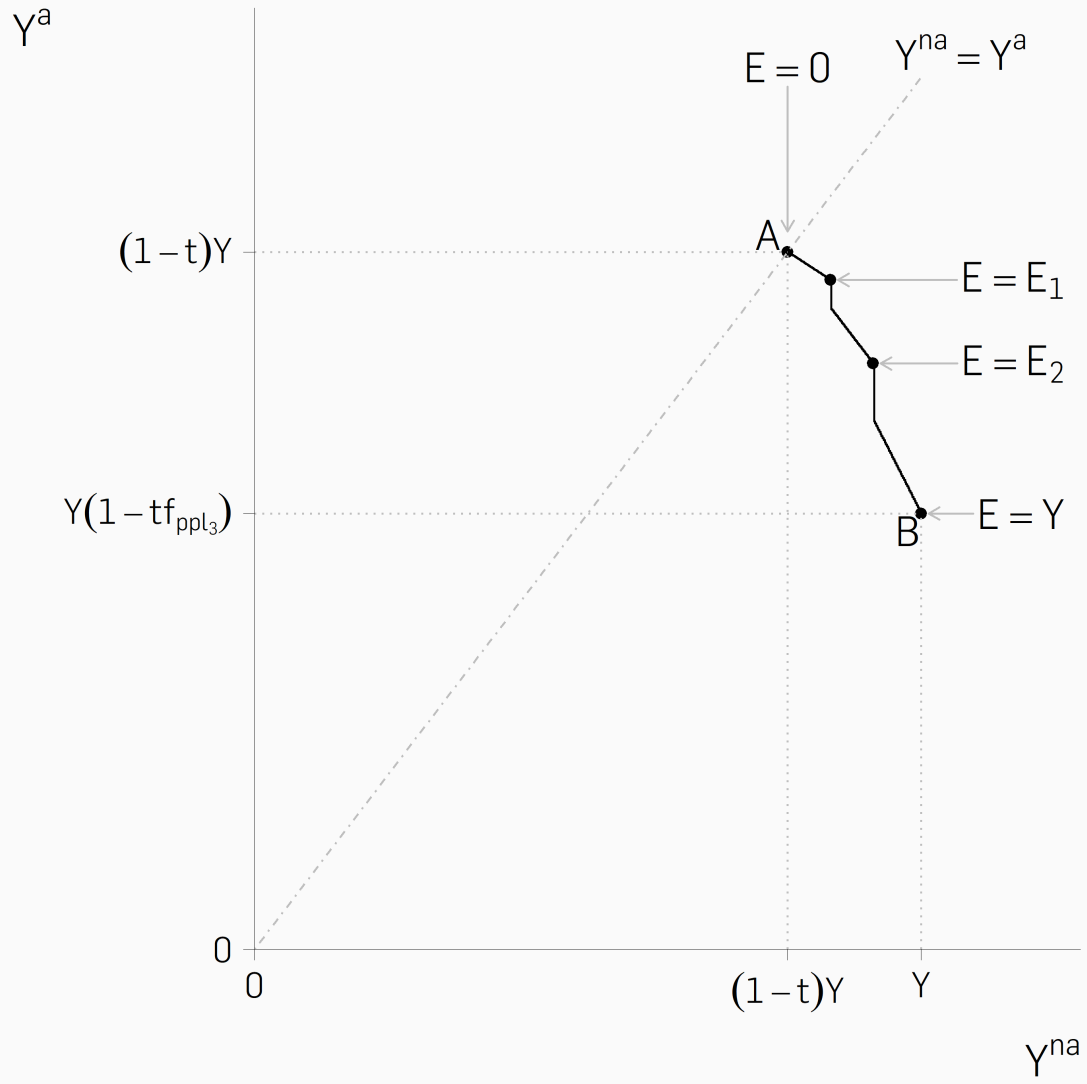
$$0 < E_1 < E_2 < Y$$

$$1 \leq f_{ppl_1} < f_{ppl_2} < f_{ppl_3}$$

Evasion Choice and Progressive Fine



Evasion Choice and Progressive Fine



A Reasonable Comparison Between Fine Structures

- Identify a reasonable comparison between fine structures is not straightforward
- Our Approach:
  1. Choice of an ”interesting” progressive piece-wise linear fine
  2. Progressive treatment with the selected progressive fine
  3. Linear treatment using **average fine on the evaders audited** in 2.
     - It is an empirical mean-preserving contraction

Several desirable features of the selected comparison linear fine:

- It is observed by the government
- It imposes the same expected burden on the evaders –irrespective of declaration shifts–
- Its value -**3.25**- is close to the theoretical average and in line with fines used in the experimental TEG literature

The Experiment Progressive Piece-wise Linear Fine

$$f_{ppl}(E) \begin{cases} 0 & E = 0 \\ 1 & 0 < E \leq 25 \\ 2 & 25 < E \leq 50 \\ 3 & 50 < E \leq 75 \\ 4 & 75 < E \leq 100 \\ 5 & 100 < E \leq 125 \end{cases}$$

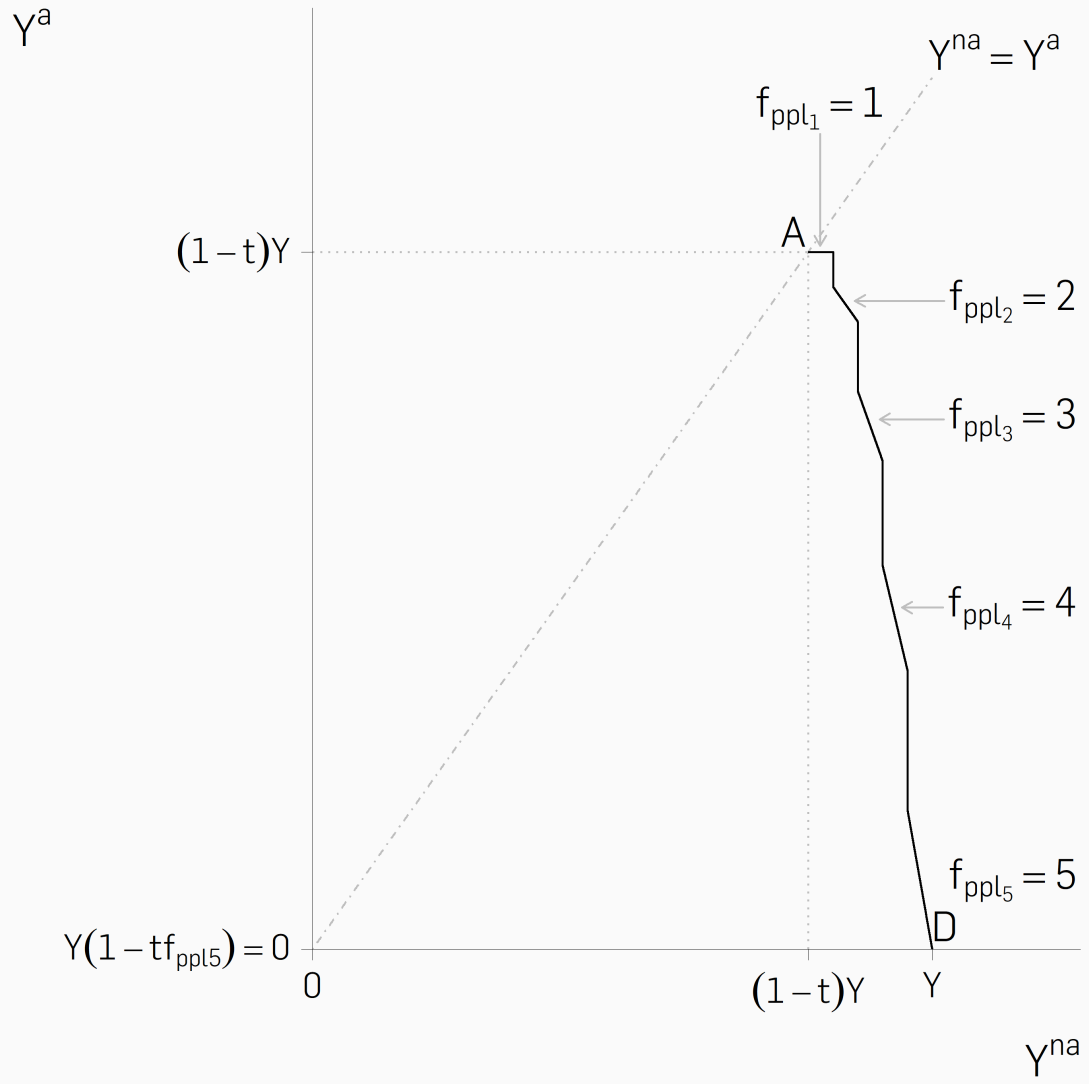
If evasion is limited, audit only recovers the tax due

- Mimics the real-world handling of mistakes in good-faith
- Identifies honest individuals

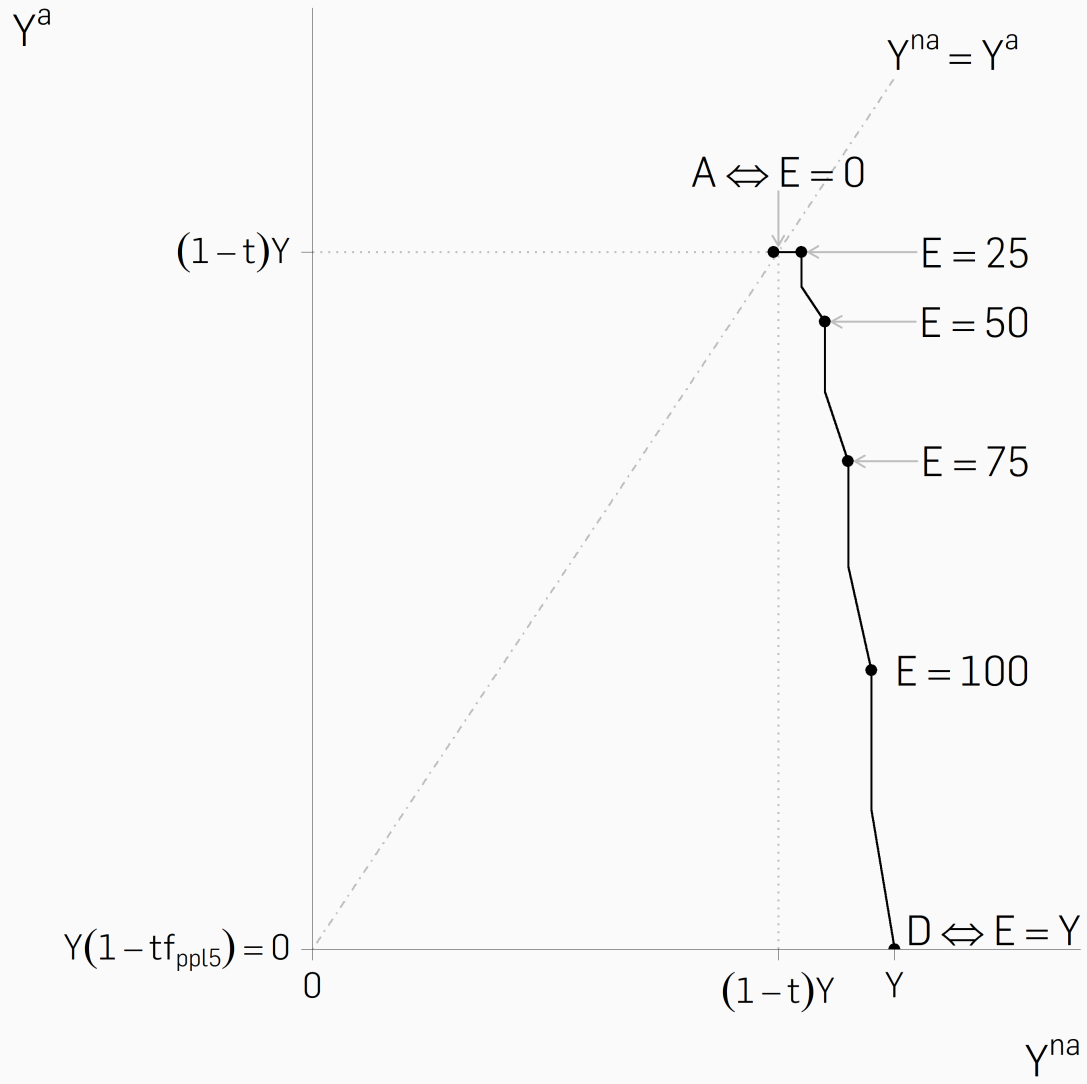
In case of total evasion, the fine leaves the individual with 0

- Gauges heterogeneity in responses

Evasion Choice and Progressive Fine



Evasion Choice and Progressive Fine



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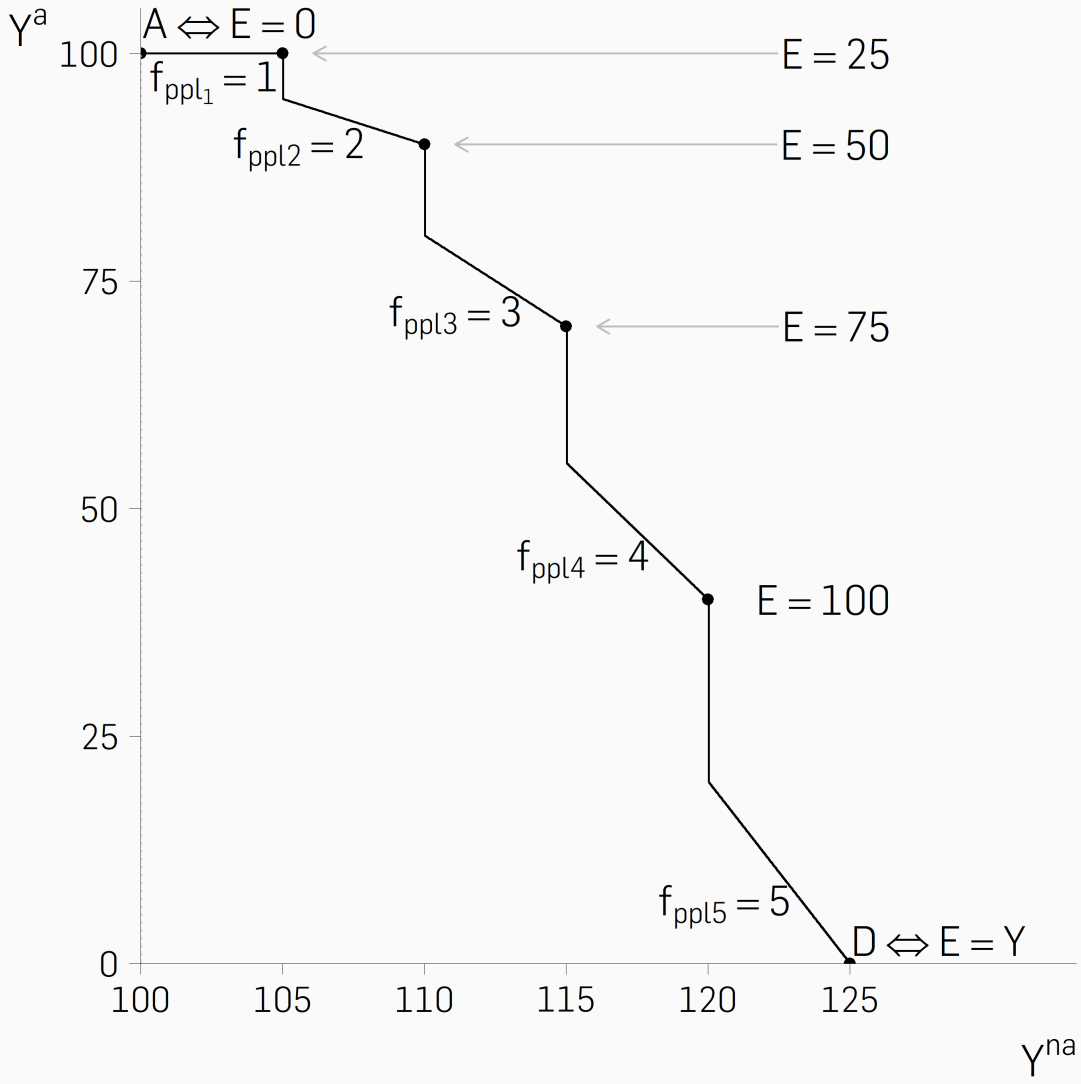
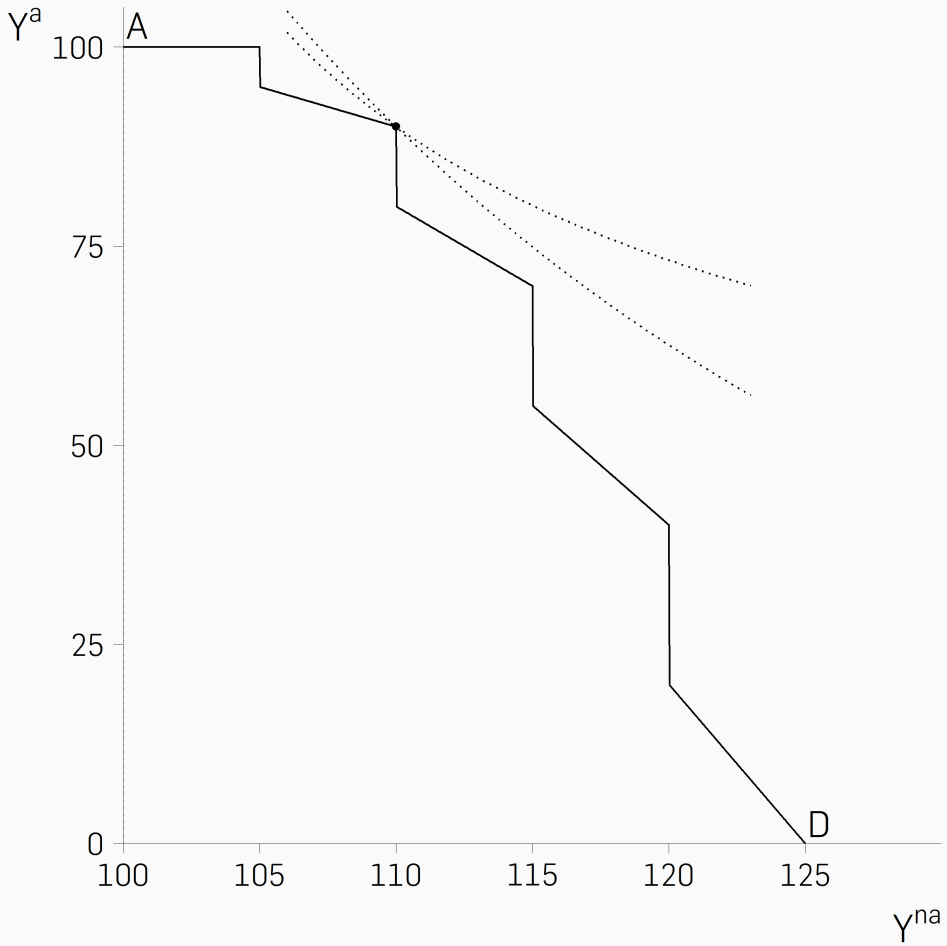
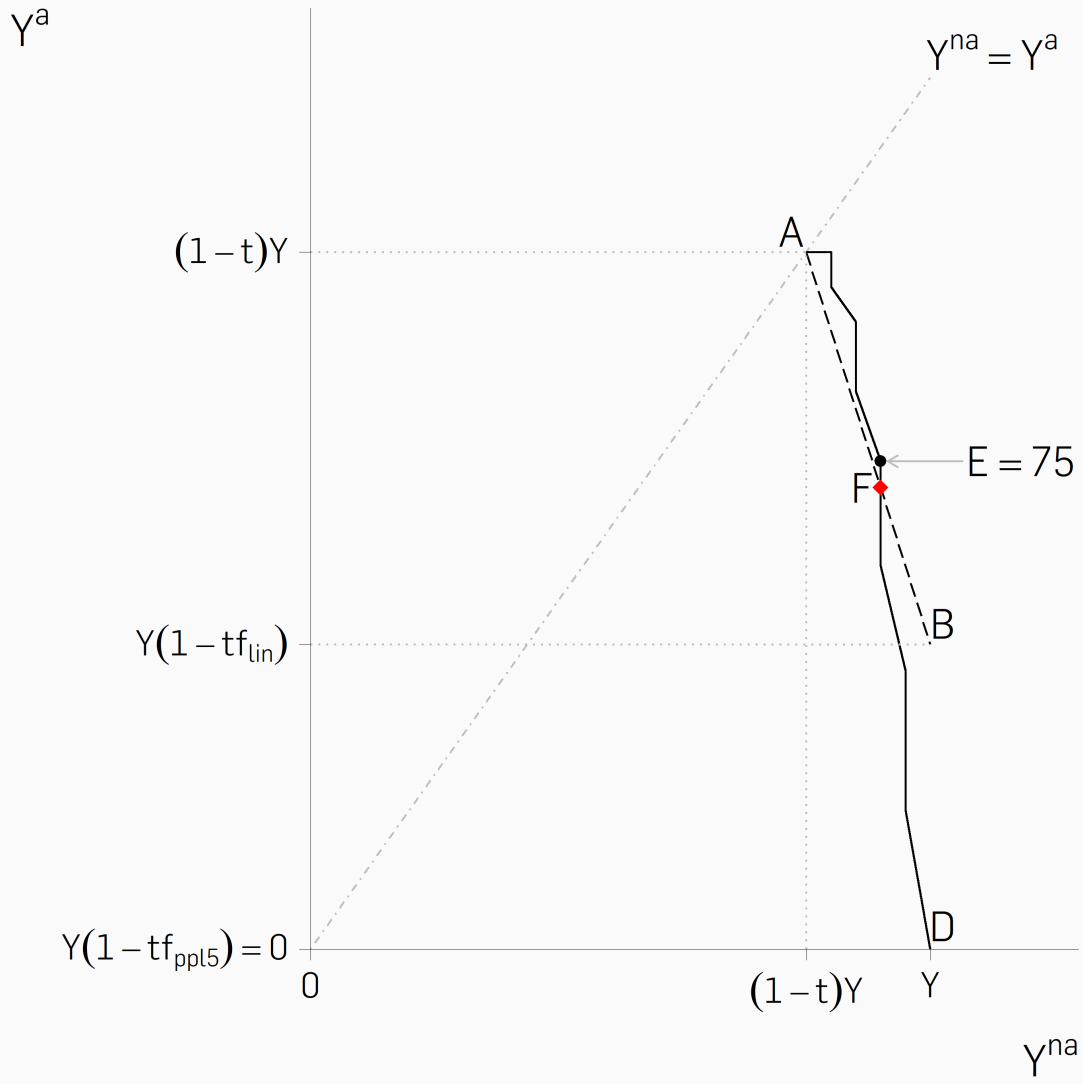


Bunching



- Discontinuities in expected costs of fine at the thresholds lead to bunching of individuals with different risk aversion

Comparing Fine Structures



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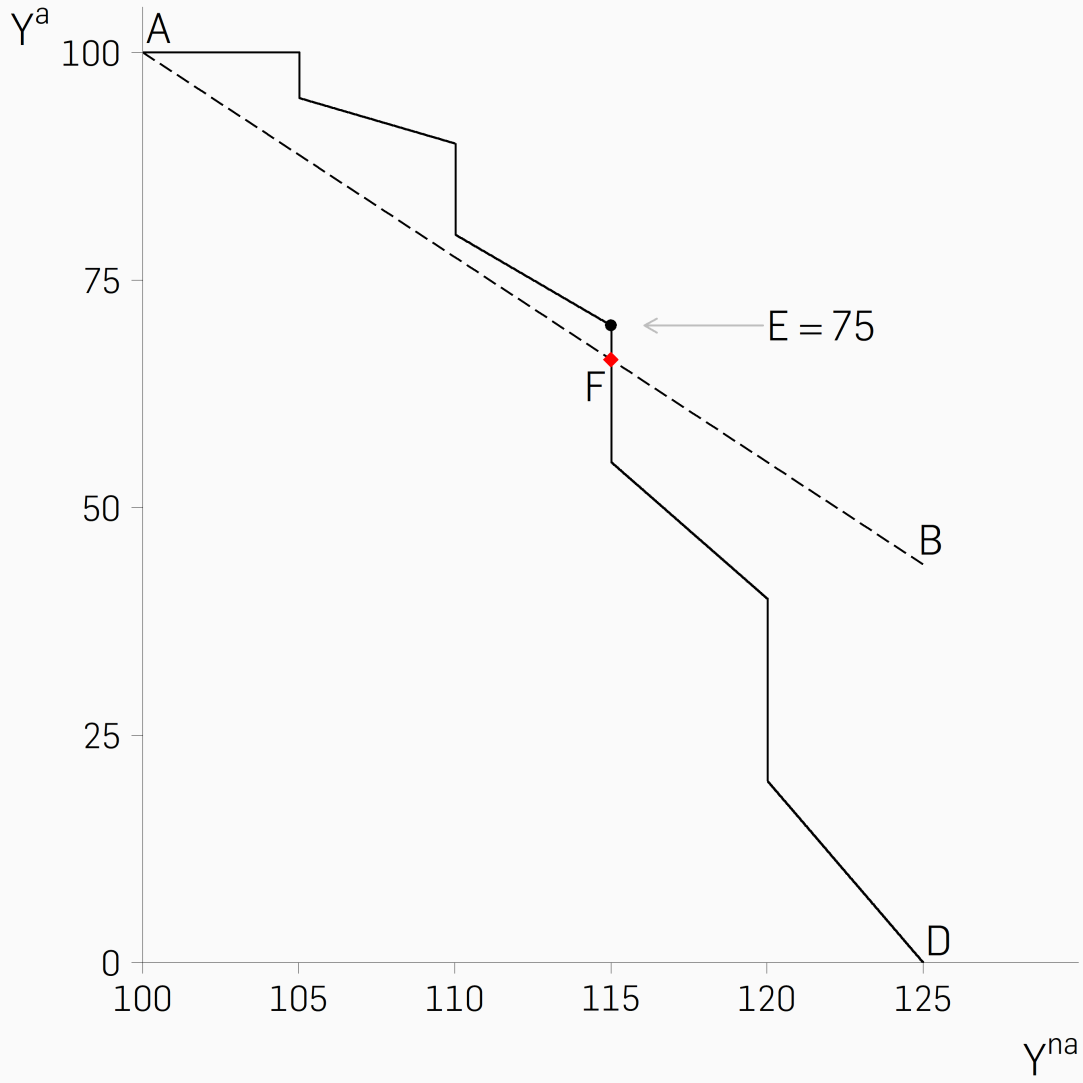

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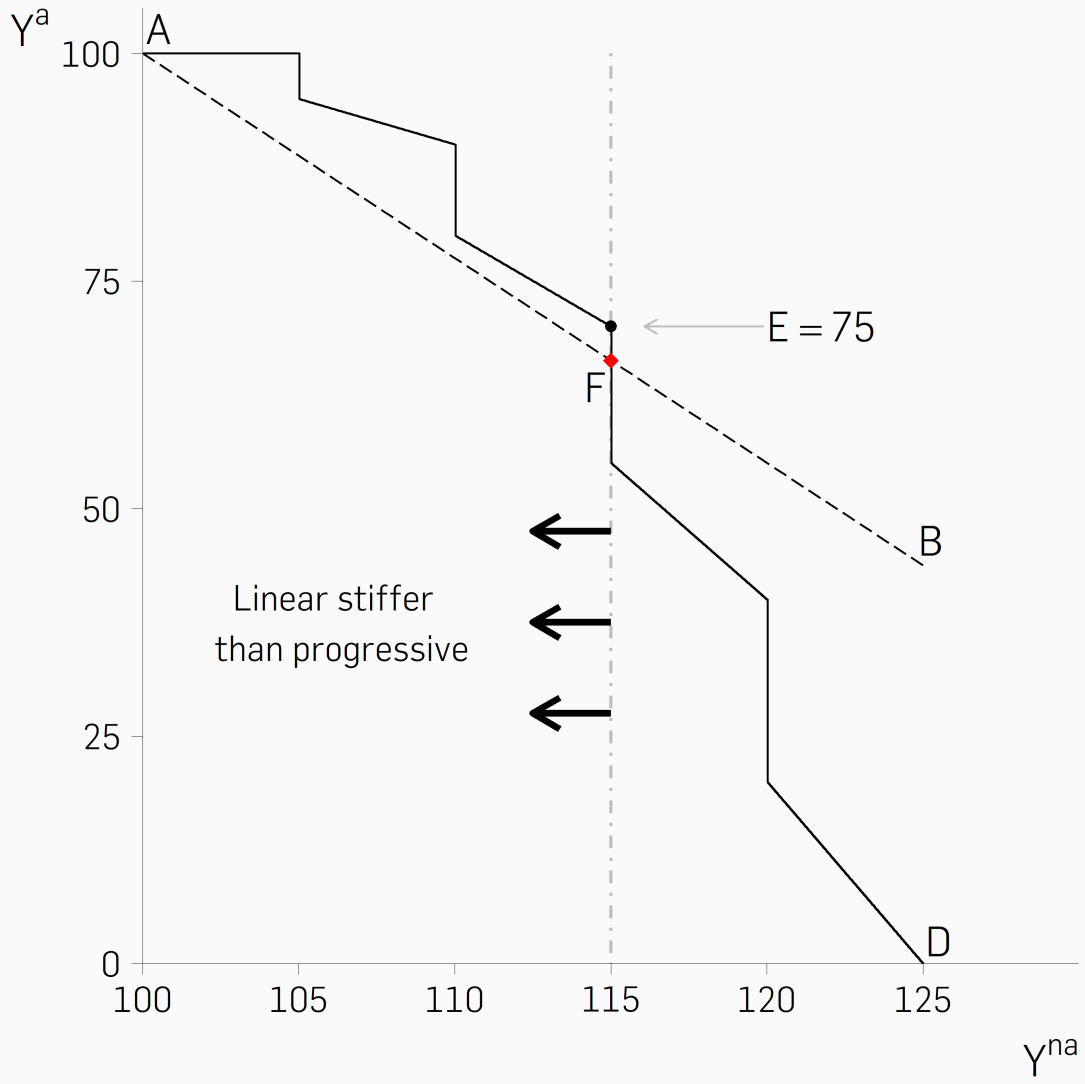

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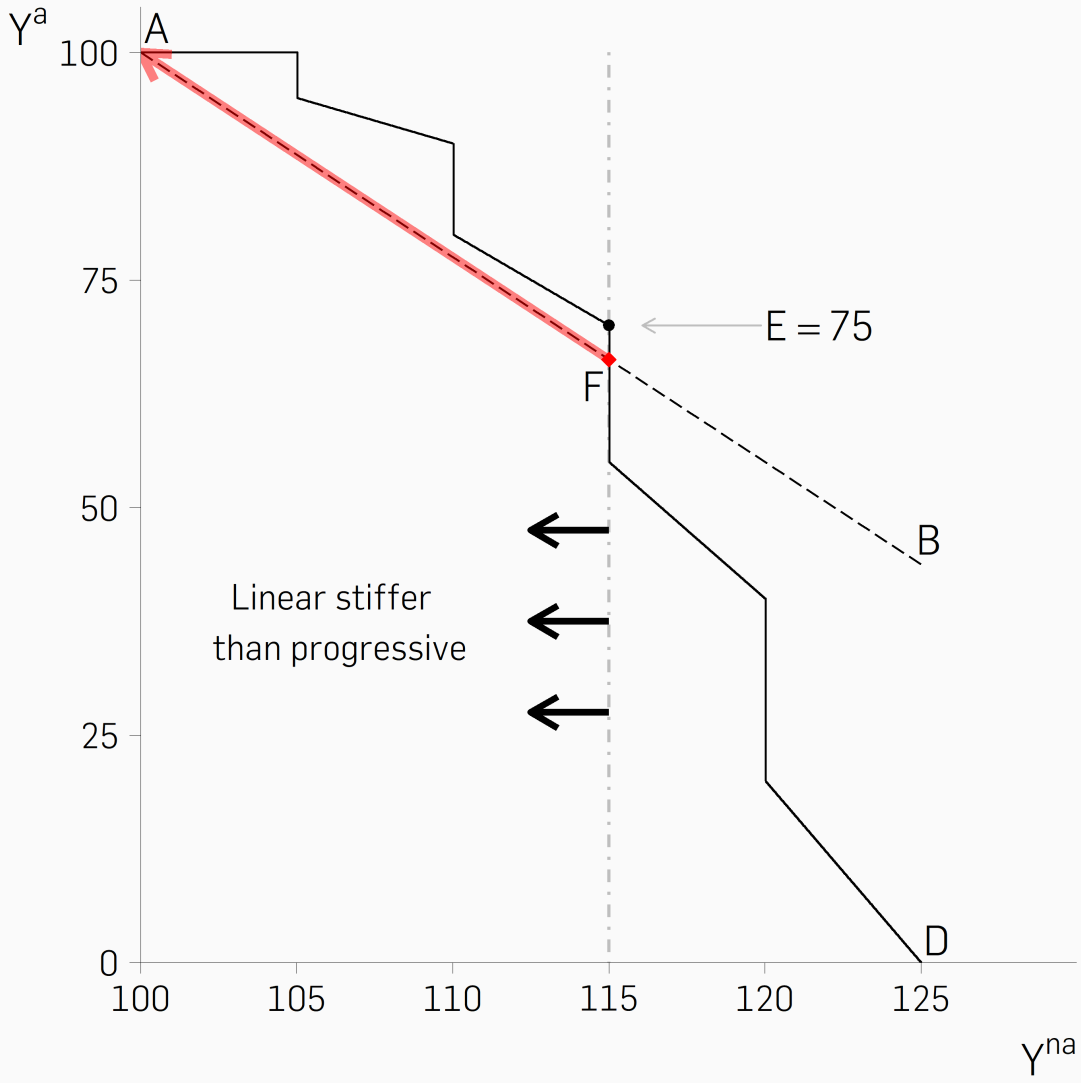

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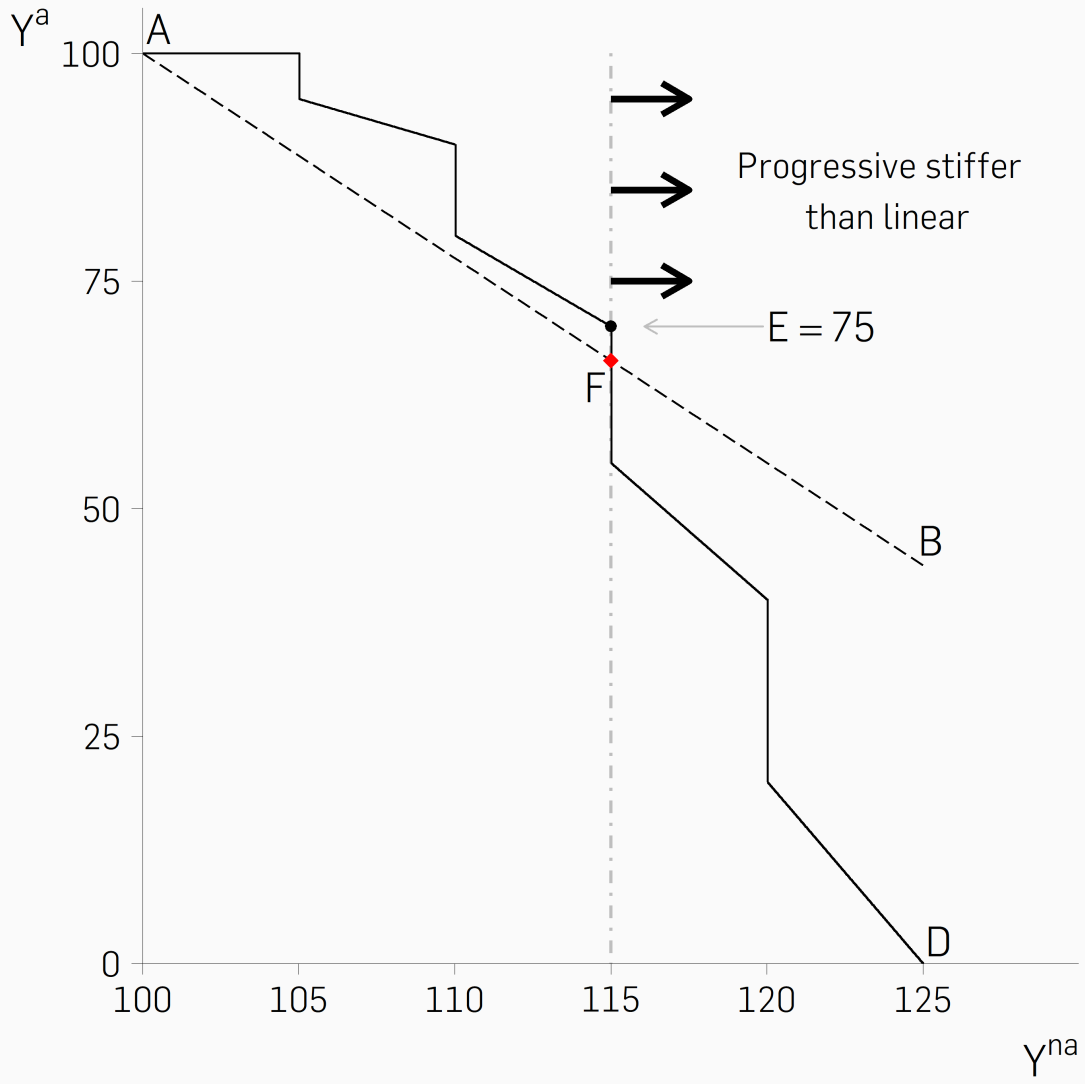

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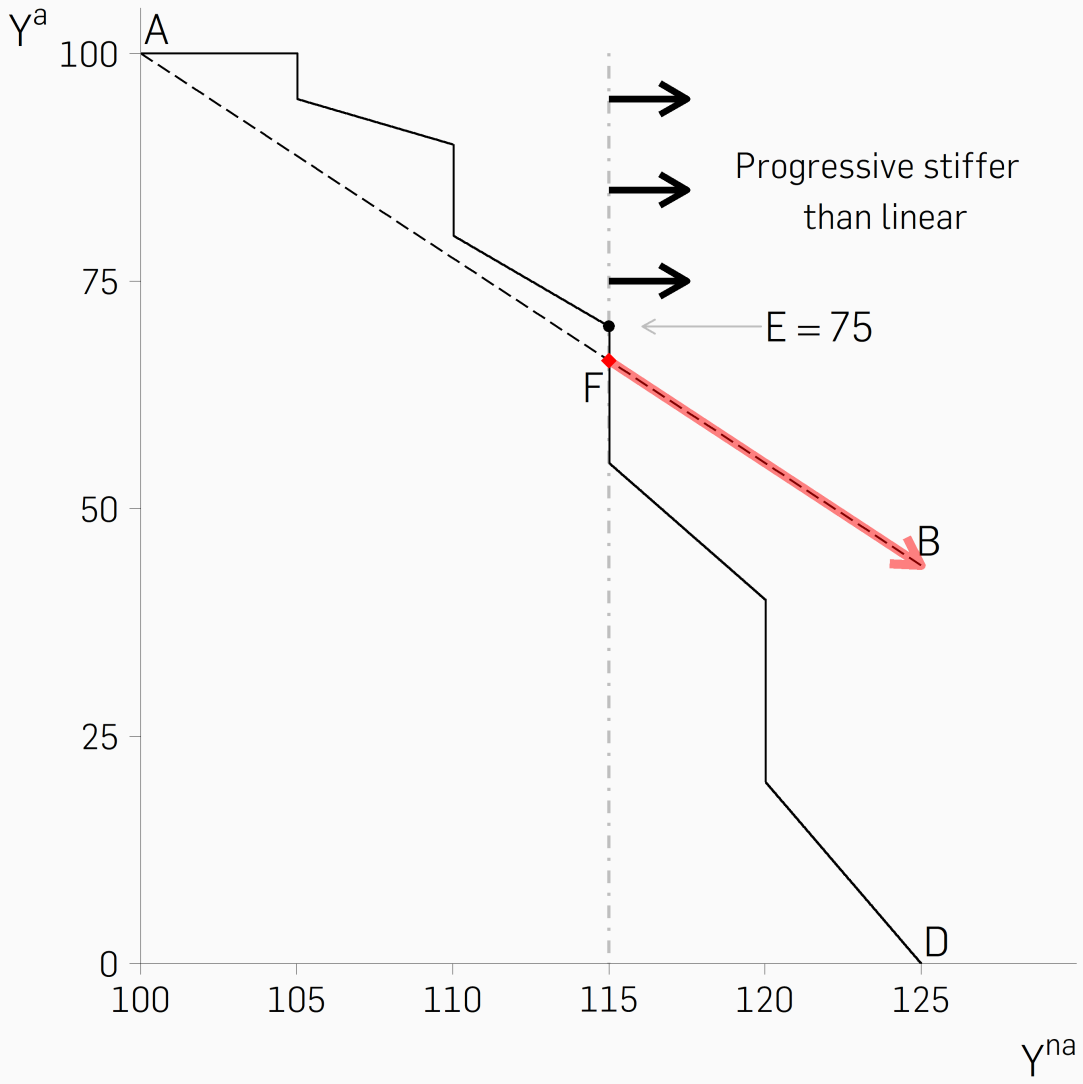


Some Implications and Questions from the Model

1. The **linear fine should induce more extreme declarations**
2. The impact of the fine structure on **Total Revenues** is ambiguous
   - 2.1 The impact on **Revenues from Declarations** is ambiguous
     - More extreme declarations in linear have an ambiguous net effect
     - Depends on the distribution of preferences, risk, honesty, etc.
   - 2.2 The impact on **Revenues from Fines (RF)** is ambiguous
     Mechanically bigger RF for ppw, for example:
     - if $E = 1 \rightarrow RF_{lin} = 1 \cdot .2 \cdot 3.25 = .65$ and $RF_{ppw} = 1 \cdot .2 \cdot 1 = .2$
     - if $E = 125 \rightarrow RF_{lin} = 125 \cdot .2 \cdot 3.25 \approx 81$ and $RF_{ppw} = 125 \cdot .2 \cdot 5 = 125$
     - Higher RF in the lower end for lin ($.65 - .2 \approx .4$) are small relative to the higher RF in the high end for ppw ($125 - 81 \approx 40$)

     Declaration change in response to fine change has opposite impact
3. Some interesting minor points i) Bunching at the thresholds (esp. 1st one) ii) Share of honest people

Experiment

The Experiment

Two between subjects treatments

- Progressive fine rate (T1)
- Linear fine rate (T2)

Both treatments entail:

1. Tax evasion game
2. Risk aversion elicitation task - Gneezy and Potters (1997)
3. Socio-demographics questionnaire
    - Age, gender, education, French origins, previous experience in experiments, self-assessed risk aversion, income, wealth

The Tax Evasion Game

- Performed Jan-Feb 2022 online
- Participants recruited using ORSEE (mostly students of BSB)
- Taxation-like framing of instructions
- Twenty periods with same course of action
  - In each period participants receive 125 ECU (25ECUs = €1)
    - Literature shows same behaviour with windfall/earned income
  - Participants declare liabilities that are taxed at 20% rate
    - Revenues used for research, no utility for participants
  - With probability .2 the declaration is audited
  - Upon audit the evaded tax debt gets fined
  - Payment is based on the outcome of 2 random periods

The Tax Evasion Game

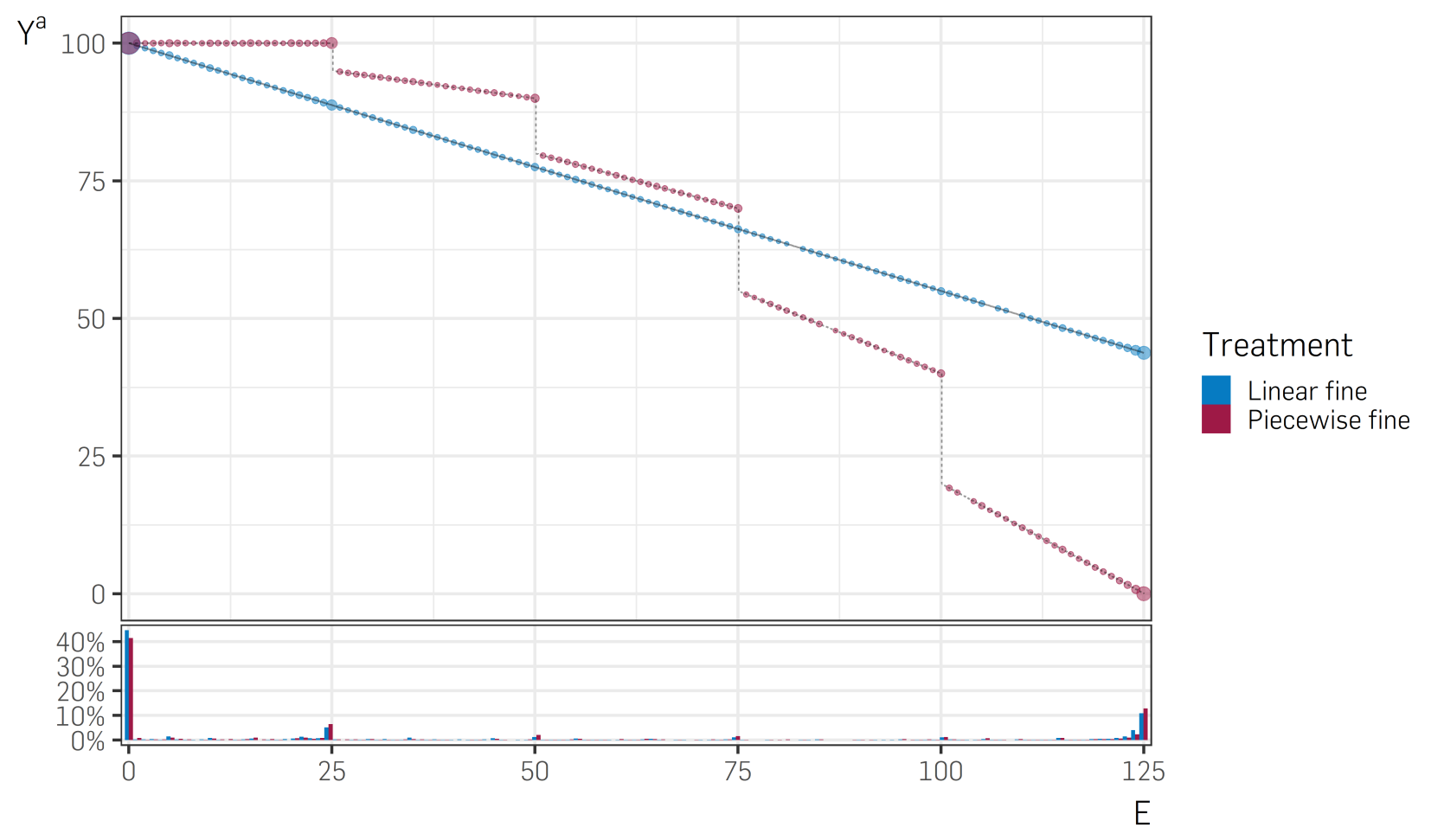
Declared Income	q		Fine Paid
	T1	T2	
125	0	0	0
124,99 - 100	1	3.25	1 [3.25] ×unpaid tax
99,99 - 75	2	3.25	2 [3.25] ×unpaid tax
74,99 - 50	3	3.25	3 [3.25] ×unpaid tax
49,99 - 25	4	3.25	4 [3.25] ×unpaid tax
24,99 - 0	5	3.25	5 [3.25] ×unpaid tax

Summary Statistics of Covariates

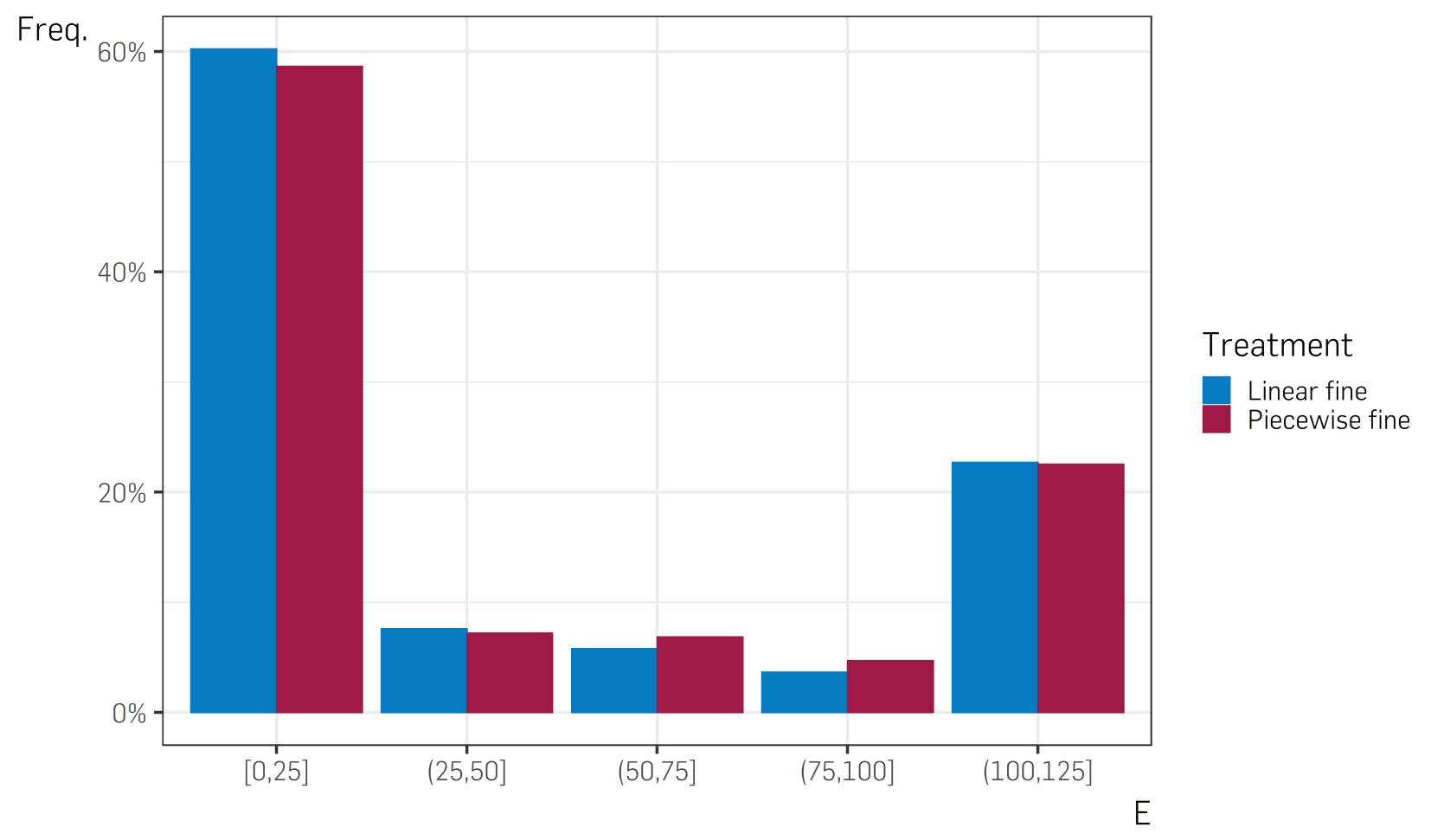
	Progressive (T1)			Linear (T2)		
Variables	Obs	Mean	SD	Obs	Mean	SD
Age	2,620	20.34	1.85	2,540	21.06	1.69
Male	2,620	0.30	0.46	2,540	0.34	0.47
Year of study	2,620	2.48	1.74	2,540	3.05	1.46
French	2,620	0.94	0.24	2,540	0.95	0.21
Spending	2,620	159.28	177.49	2,540	174.93	148.87
Saving	2,620	132.92	177.23	2,540	369.09	2,645
Risk aversion (question)	2,620	5.60	2.00	2,540	5.81	2.10
Risk aversion (task)	2,620	5.71	3.22	2,540	5.98	3.00
Earning Risk (task)	2,620	14.18	10.22	2,540	12.43	10.06

Results

Evasion Behaviour



Evasion Behaviour



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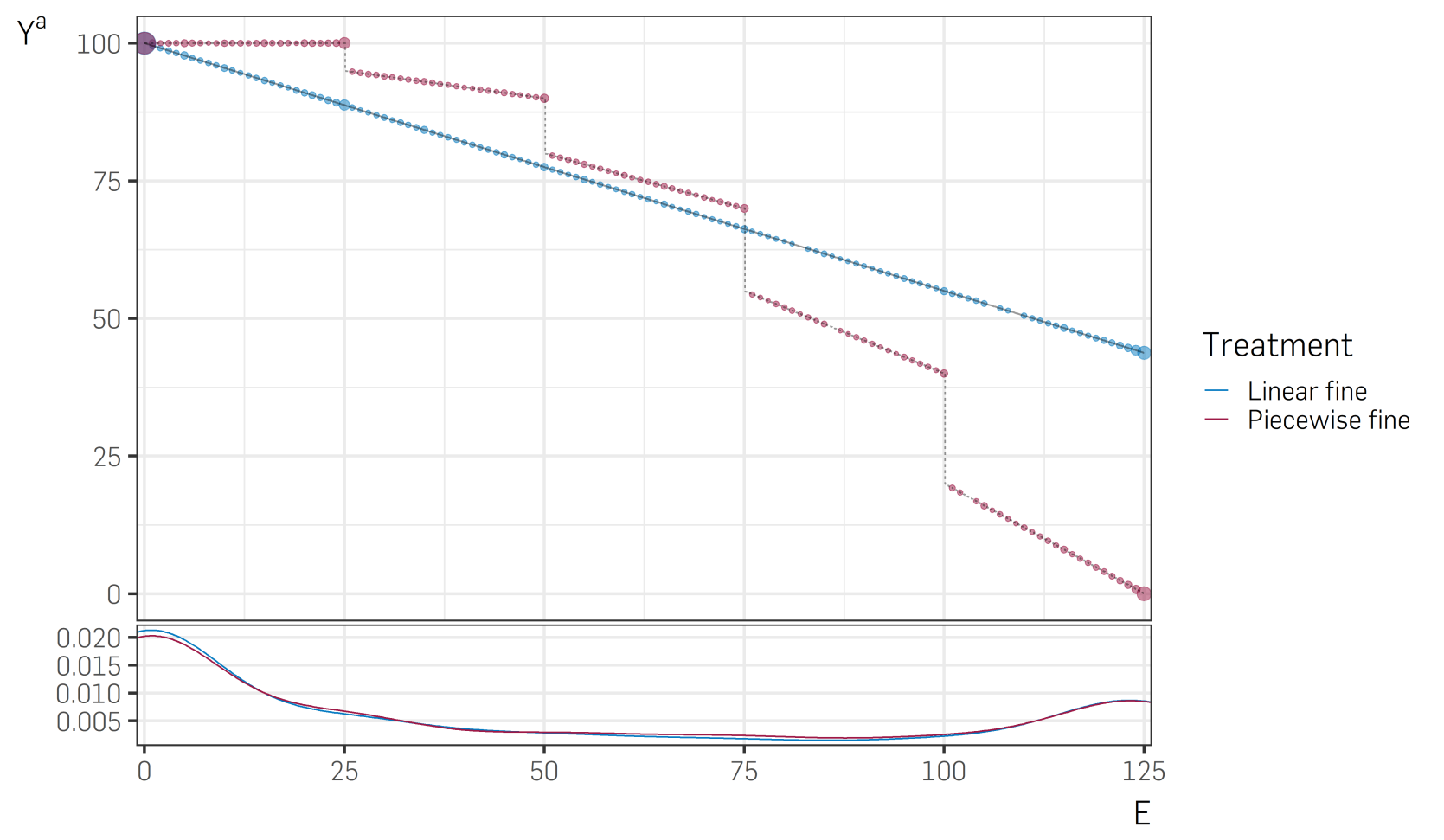

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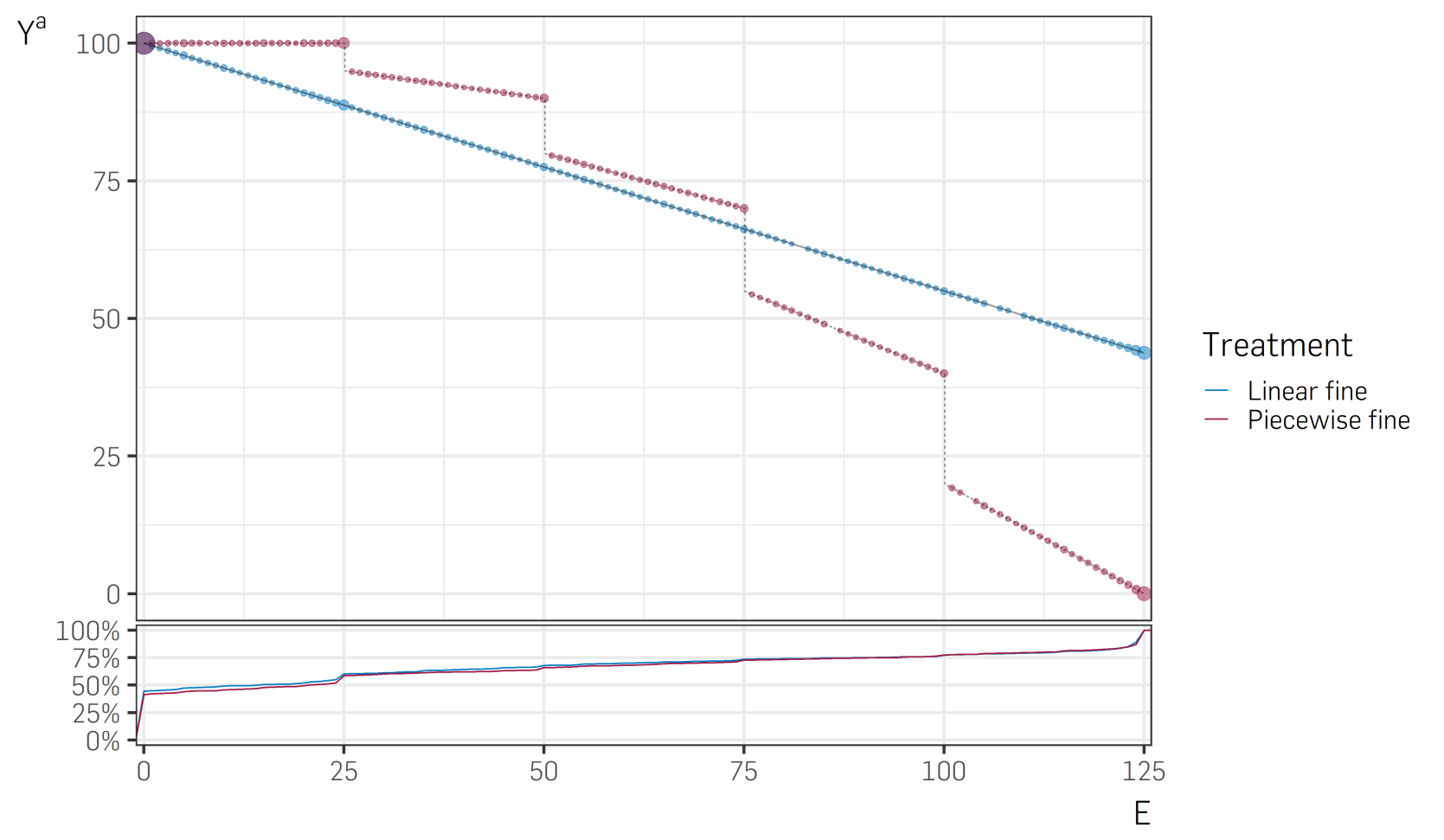
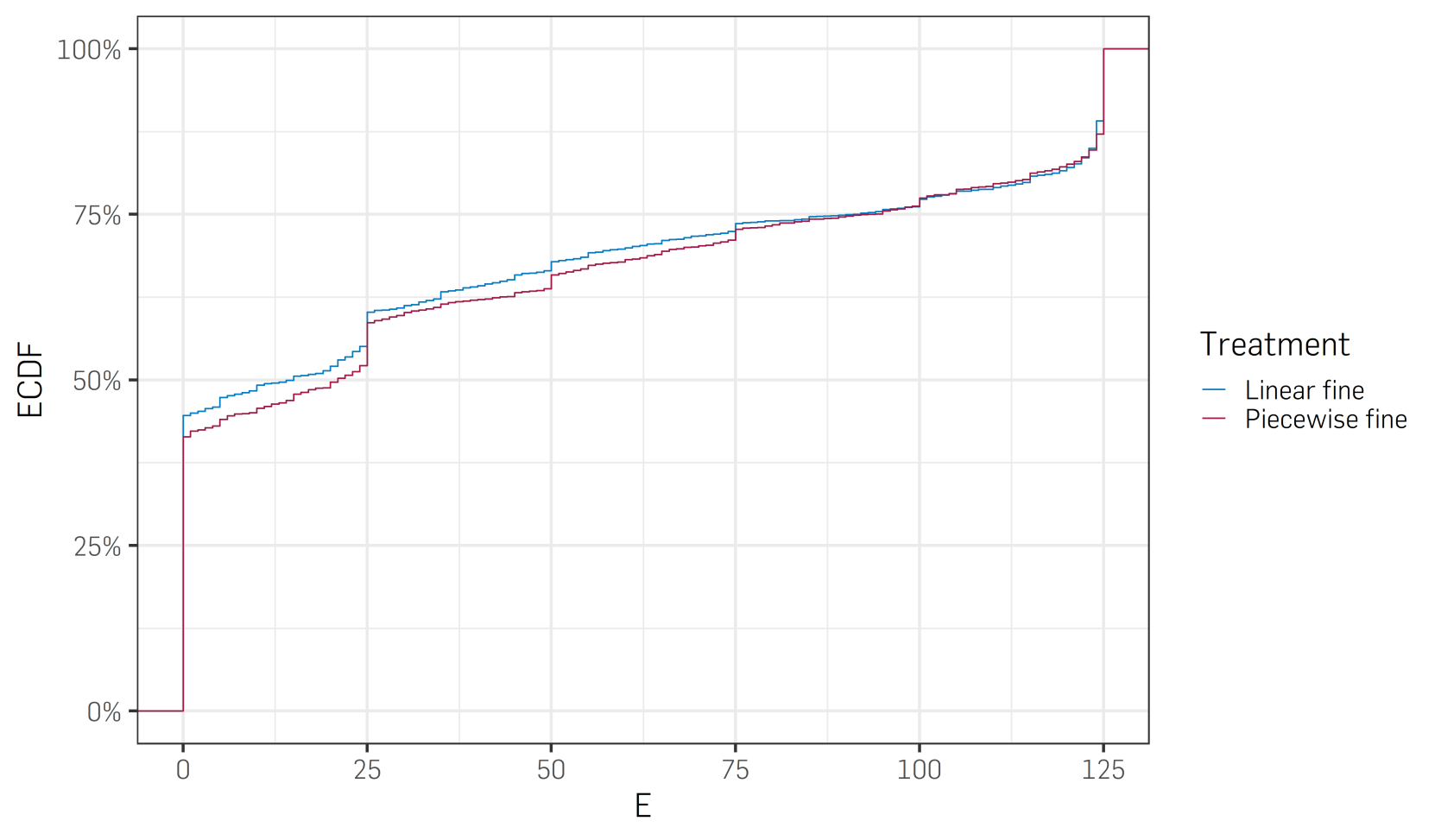
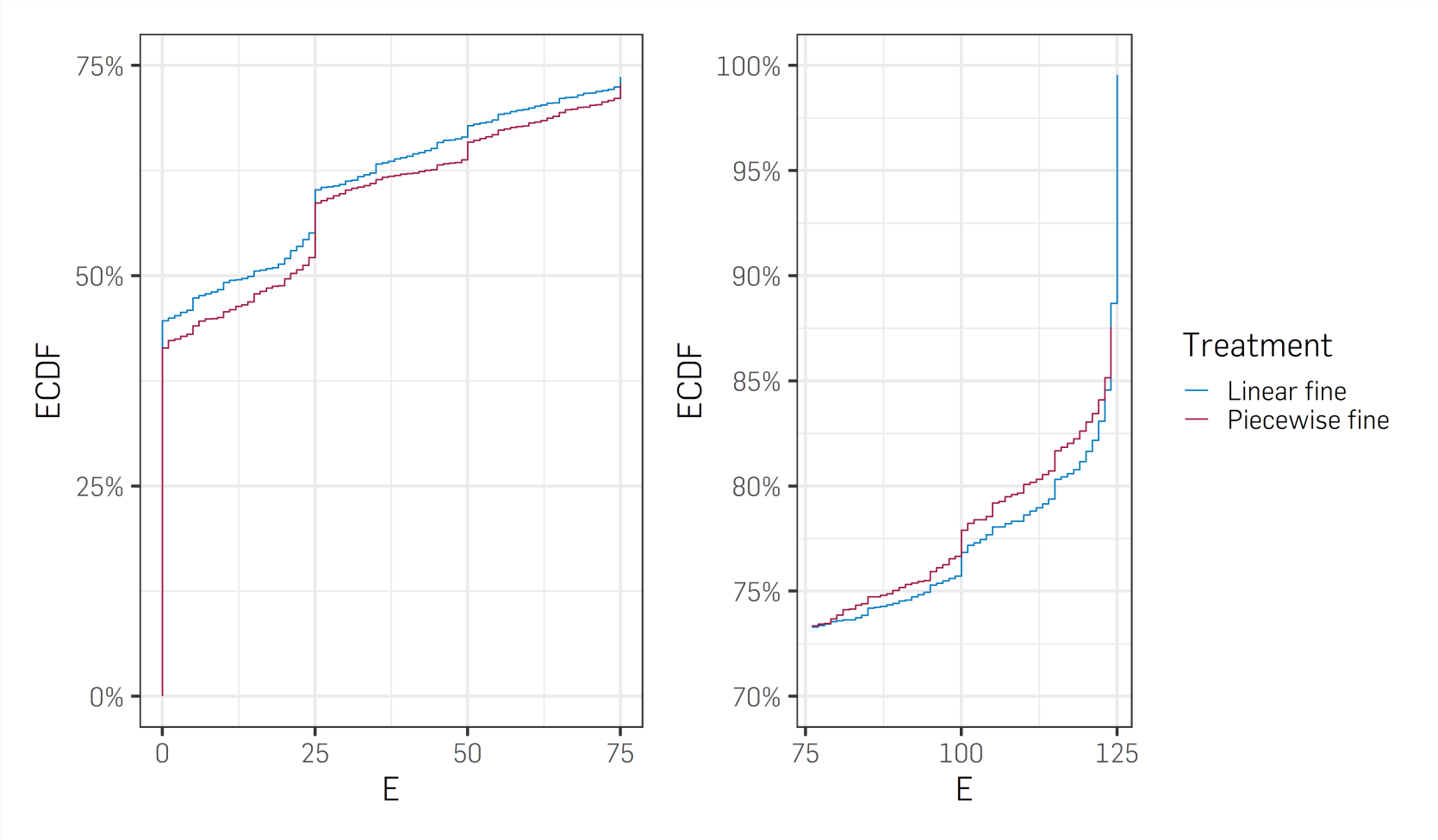


ECDF of Evasion



Polarization of Evasion - ECDF



Polarization of Evasion - Tests

Mann Whitney test

- Taking a draw from lin and ppl, is prob lin>ppl bigger than .5?

Kolmogorov-Smirnov test

- Is the lin CDF above ppl?

T test

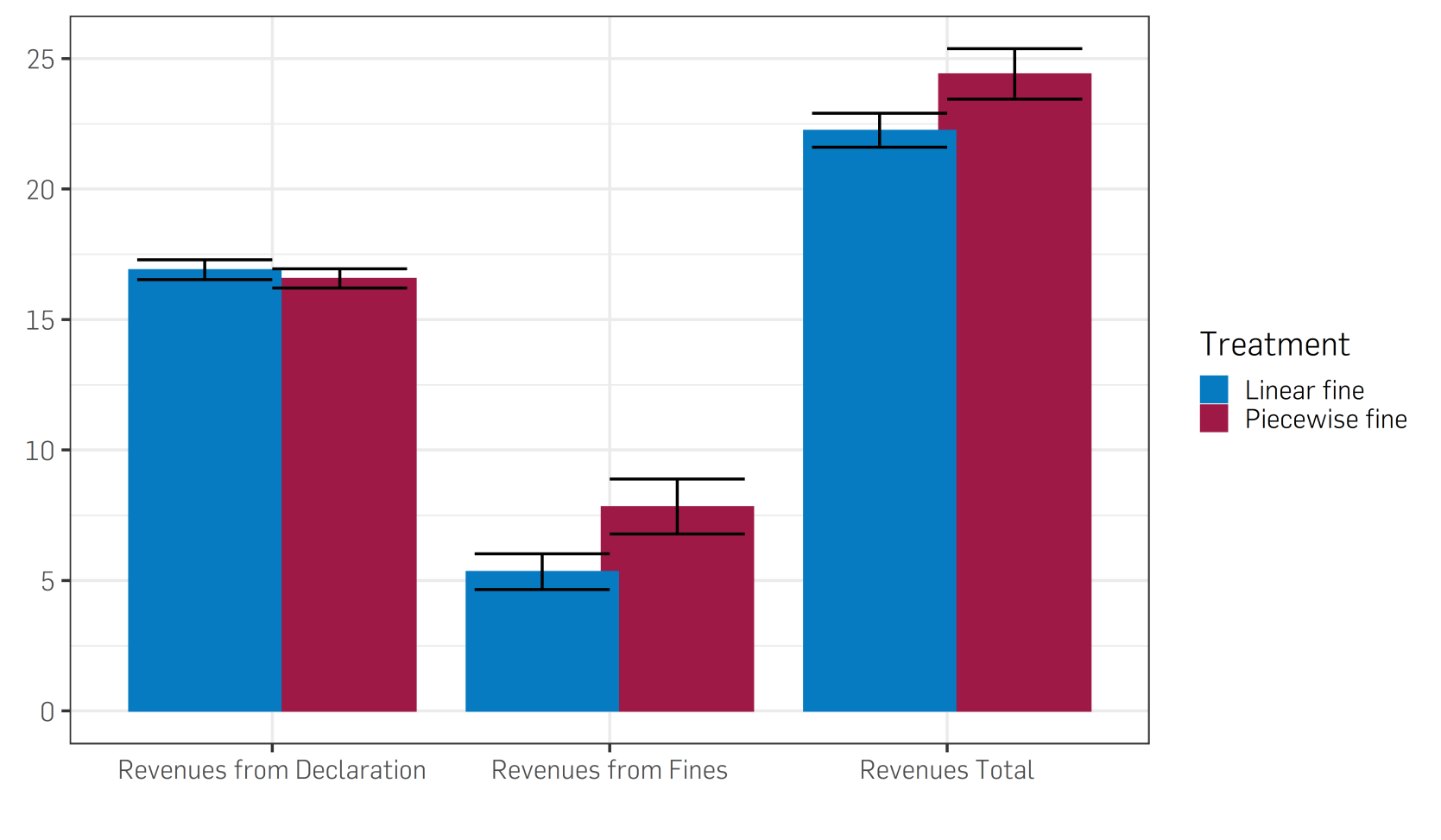
- Is the average of lin bigger than the ppl one?

$E \leq 75$	$E > 75$
M-W = 0.95%	M-W = 80.17%
K-S = 5.14%	K-S = 31.61%
T = 2.55%	T = 5.87%

Outcome variables Averages

Variable	Progressive	Linear
Declared income	82.82	84.78
	(49.64)	(49.66)
Fine	8.11	5.29
	(28.66)	(17.88)
Total revenues	24.67	22.25
	(26.26)	(17.02)

Average Revenues



Declaration, Revenues and Fines

- Evasion is more polarized under the linear fine for low levels of evasion, only marginally for high levels
- Average Revenues from declaration are not different across fine regimes

Higher Revenues from Deterrence **+47%** and Total revenues **+10%** (declaration+fines) under progressive fine:

- The mechanical increase of RF of the progressive fine is bigger than the reduction caused by declaration behavioural responses
- Results hold in a Panel Tobit specification, also accounting for covariates

Treatment effect on income declared, fine and revenues (no covariates)

	Income declared	Fine	Total revenues
Fixed rate	6.292	-17.02**	-2.460***
	(8.654)	(7.160)	(0.711)
Round	-0.703***	0.637	0.0418
	(0.214)	(0.494)	(0.0594)
Const.	115.1***	-152.8***	23.11***
	(6.498)	(9.639)	(0.798)
sigma_u			
Const.	66.13***	33.95***	1.507
	(3.621)	(4.590)	(0.997)
sigma_e			
Const.	77.67***	125.9***	24.36***
	(1.315)	(4.899)	(0.266)
N	5160	5160	5160

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

Treatment effect on income declared, fine and revenues (with covariates)

	Income declared	Fine	Total revenues
Fixed rate	7.373	-18.04**	-2.445***
	(8.229)	(7.231)	(0.708)
Round	-0.789***	0.748	0.0292
	(0.220)	(0.505)	(0.0609)
Decision time	-0.147*	0.202	-0.0217
	(0.0880)	(0.177)	(0.0239)
Risk loving (task)	-0.447	-0.424	-0.0517
	(1.411)	(1.226)	(0.121)
Risk loving (question)	-11.03***	5.506***	-0.340*
	(2.164)	(1.888)	(0.185)
Age	2.899	-0.233	0.173
	(2.345)	(2.030)	(0.201)
Female	-16.26*	1.833	-1.444*
	(8.737)	(7.620)	(0.751)
Spending	0.00550	-0.0106	-0.000324
	(0.0253)	(0.0219)	(0.00217)
Savings	-0.00409*	0.00113	-0.000426**
	(0.00216)	(0.00177)	(0.000201)
Const.	133.0***	-178.5***	23.16***
	(49.71)	(44.12)	(4.314)
sigma_u			
Const.	60.92***	32.26***	0.685
	(3.383)	(4.633)	(2.082)
sigma_e			
Const.	77.65***	125.8***	24.37***
	(1.314)	(4.894)	(0.266)
N	5160	5160	5160

Conclusions

Conclusion

- We provide the **first experimental evidence on the impact of the fine structure on declaration behaviour**
- In line with theoretical intuition, a **linear fine leads to more extreme declaration outcomes than a progressive one** for low evaders, only marginally significant for high evaders
- **No difference in average revenues from declarations** across regimes
- **Total Revenues and Fine revenues higher under progressive fine**
- Linear fine increase the honest declarations but the progressive fine extracts more revenues from evaders (that could be redistributed back to the honest)

Further Research

- Perform the experiment in **within** setting to validate our results at the individual level
  - Investigate role of risk aversion
    - Who $E > 75$ under progressive **increase** evasion under linear
    - Who $E < 75$ under progressive **decrease** evasion under linear
  - Estimate elasticities of evasion to the fine rate by evasion brackets
- Estimate **reduction in inequality of a tax-and-transfer system** in the two fine regimes

Thank you!

Questions?